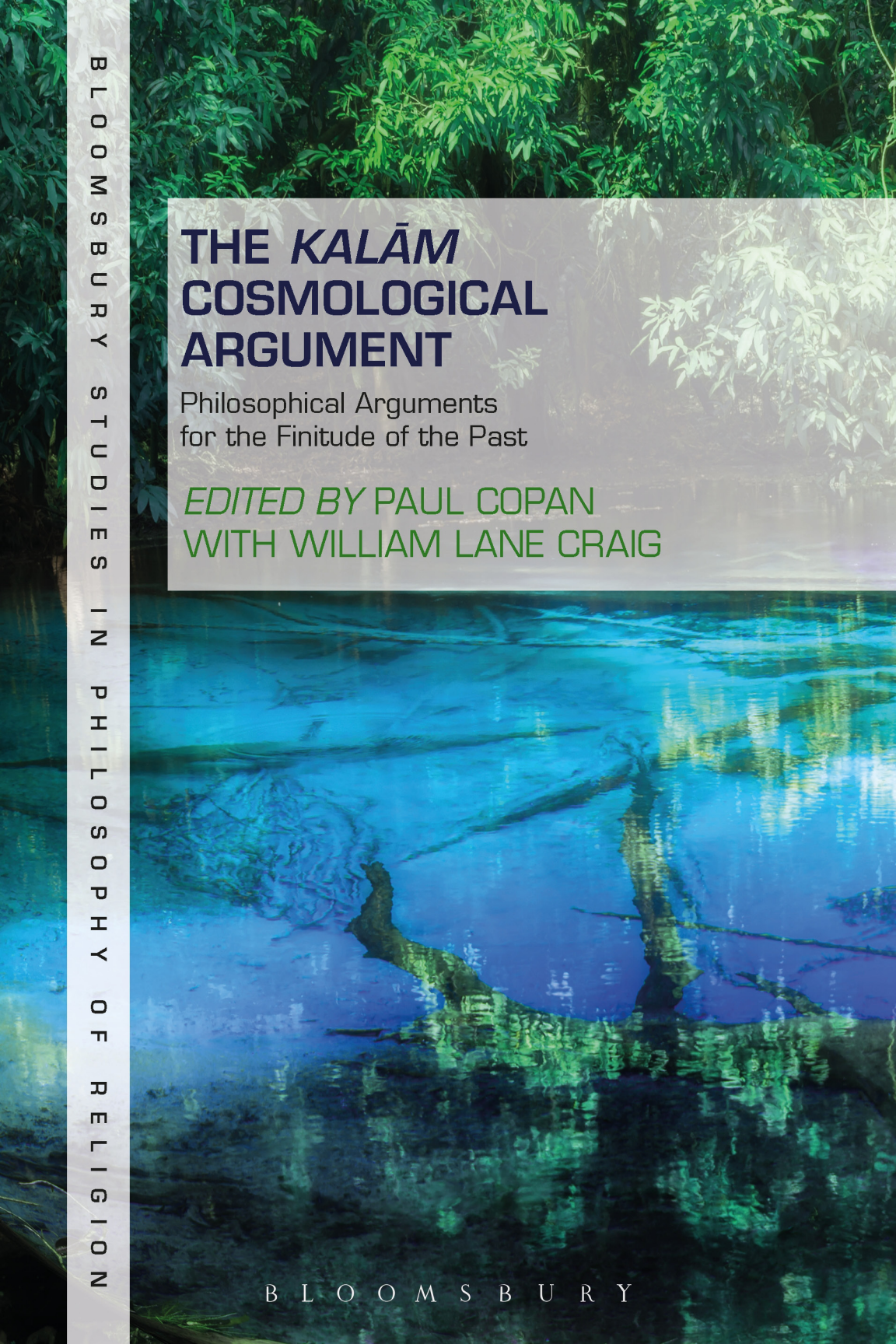

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THE KALĀM COSMOLOGICAL ARGUMENT
Philosophical Arguments for the Finitude of the Past
EDITED BY PAUL COPAN WITH WILLIAM LANE CRAIG
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The *Kalām* Cosmological Argument

Bloomsbury Studies in Philosophy of Religion

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The *Kalām* Cosmological Argument

Philosophical Arguments for the Finitude of the Past

Edited by Paul Copan
with William Lane Craig

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Foreword

This is the first volume of a two-part anthology on perhaps the most-discussed argument for God's existence in our day. The *kalām* cosmological argument contends that the past cannot be infinite. It considers these kinds of questions: *Did the universe begin to exist? If so, did it have a cause? Or could it have come into existence uncaused, from nothing?* Because something cannot come into being from nothing, the argument maintains, the beginning of the universe, which is supported by both philosophical argument and scientific evidence, must have been caused rather than uncaused.

This particular volume examines the *philosophical* arguments for the finitude of the past. It addresses such questions as these: *Is an infinite series of past events metaphysically possible? Should actual infinites be restricted to theoretical mathematics, or can an actual infinite exist in the concrete world?* The essays in this volume by *kalām* proponents and detractors engage in lively debate about the nature of infinity and its conundrums; about frequently used *kalām* argument paradoxes of Tristram Shandy, the Grim Reaper, and Hilbert's Hotel; and about the infinity of the future.

The Introduction to this volume not only presents an overview of the *kalām* cosmological argument, its background, and its recent resurgence (as does the Introduction in the companion volume) but also provides chapter summaries of the essays on both the first premise of the argument and the philosophical support of the second premise of the argument.

I trust that this work and its companion volume—*The Kalām Cosmological Argument: Scientific Evidence for the Beginning of the Universe*—will provide an engaging, fresh presentation of this enduring argument for God's existence from the vantage point of both its supporters and its opponents.

Introduction

Paul Copan

In 1979 William Lane Craig published *The Kalām Cosmological Argument*.[1] Like Hume's *Enquiry*, it fell stillborn from the presses, going immediately out of print. But over the decades since its first publication, it has steadily grown in influence until today; the *kalām* cosmological argument (KCA) has become one of the most widely debated arguments of natural theology. Quentin Smith, writing in *The Cambridge Companion to Atheism* (2006), observes,

> A count of the articles in the philosophy journals shows that more articles have been published about Craig's defense of the Kalam argument than have been published about any other philosopher's contemporary formulation of an argument for God's existence. Surprisingly, this even holds for Plantinga's ontological argument and Plantinga's argument that theism is a rationally acceptable basic belief. The fact that theists and atheists alike "cannot leave Craig's Kalam argument alone" suggests that it may be an argument of unusual philosophical interest or else has an attractive core of plausibility that keeps philosophers turning back to it and examining it again.[2]

Craig has continued to develop the argument of the original book (now back in print), revising, updating, and supplementing it and responding to published critiques.[3]

Craig's interest in the KCA (whose provenance will be explained momentarily) was sparked in 1971 by his reading of a little-known book by the Christian philosopher Stuart C. Hackett (1925–2012)[4] entitled *The Resurrection of Theism* (1957).[5] In his book Hackett called attention to this largely forgotten version of the cosmological argument.[6] Hackett argued that an infinite temporal regress of events—a series of past causes and effects—is impossible. Even though an infinite series may be conceivable in mathematics without contradiction, it involves "self-contradiction in the realm of being"—the realm of actual existents. He wrote:

> We are, in fact, familiar with the infinite series in mathematics: for example . . . -3, -2, -1, 0, 1, 2, 3 . . . ; and we do not say that such a series involves self-contradiction. Why, then should we say that such a series does involve self-contradiction in the realm of being?
>
> I conceive that it will be a sufficient answer to this objection if I show that the hypothesis of an infinite series of actual existents involves self-contradiction.

> This is precisely the case, for either such a series consists of determinate parts, or it does not. If it does not, the series would have no applicability to the present universe, since, both spatially and temporally, the total manifest universe consists of determinate parts. But if the proposed series is thus constituted of such parts, self-contradiction is manifestly involved: for no series of determinate parts could add up to an actually infinite series. Yet such an actually infinite series must exist unless the series culminates in the absolutely self-conditioned being or God, which is contrary to the hypothesis that the series is actually infinite. Furthermore, suppose that there does exist such an infinite series of causes and effects. At any given point in time, the series would be infinite, yet greater than at any previous time: but this is self-contradictory since an actually infinite series does not admit of increase or decrease. Therefore, either the series is not infinite, or the progression of temporal events is an illusion; but then there is no way to account for the illusion. I therefore conclude that an infinite series of actual existents is inconceivable because self-contradictory and that therefore the objection is invalid. And if someone should deny that the law of contradiction applies here, I answer that this type of objection is self-annihilating.[7]

What Hackett called a "self-contradiction in the realm of being" would today be called a metaphysical impossibility. Craig was particularly intrigued by the notion that an infinite regress of past events, while not strictly logically impossible, might be metaphysically impossible.

As background for engagement with Hackett's argument, Craig undertook to study the history of the cosmological argument for the existence of God. As a result, he proposed a threefold taxonomy of cosmological arguments which has been widely adopted: the Thomistic cosmological argument, the Leibnizian cosmological argument, and the *kalām* cosmological argument.[8]

Versions of the cosmological argument

Unlike the monistic Advaita Vedanta school of Hinduism, which denies the existence of an external world (as *maya*, "illusion") and affirms the pure consciousness of Brahman as the sole reality, cosmological arguments take for granted the fact of the universe's existence. Furthermore, they aim to show there must exist—or likely exists—a First Cause or Sufficient Reason for the existence of the world or universe. The argument concludes that a Cause must ultimately be responsible for contingency, change, motion, causation within the universe or with reference to the existence of the universe (*kosmos*) itself. Besides Plato and Aristotle, other notables who have defended the cosmological argument include John Philoponus, ibn Sīna, al-Ghāzālī, Maimonides, Anselm, Aquinas, Bonaventure, Scotus, Descartes, Spinoza, Leibniz, and Locke.

The *Thomistic* cosmological argument is named for the medieval philosopher-theologian Thomas Aquinas. Yet it was Aristotle who supplied Thomas with the metaphysical structure that inspired his formulation of the "Five Ways," or purported

"proofs" for God's existence. The first three ways (respectively) argue for God from motion, the causation of existence, and contingent and necessary entities. His is not an argument for a temporal beginning to the universe, which Aquinas thought could not be demonstrated or proven (Aquinas rejected mere probability arguments). In fact, the universe's beginning is like the doctrine of the Trinity—a matter specially revealed in Scripture and accepted by faith.

Rather, Aquinas's is a kind of metaphysical argument. God, who has no potentiality but is pure actuality, must exist in order to bring potentiality to actuality. Moreover, only a necessary, uncaused being, whose essence and existence are identical—that which is being (*esse*) itself—could be the ground for the existence of all contingent things that participate in or have being (*habens esse*).

Following Aristotle's potency-act distinction, Aquinas refers to *motion*, by which he means bringing about something that is, say, potentially hot to being actually hot. Ultimately, change must come from something unchangeable and without potentiality—namely, God. God is *ipsum esse subsistens*—subsistent being itself, a being whose essence just *is* existence. Thus, an infinite series of what he called essentially ordered causes is impossible (e.g., a hammer that is made to pound a nail, which is moved by an arm, which is moved by the choice of a personal agent, and so on). Or consider the movement of a train: the simultaneous movement of the cars cannot be explained by the movement of the preceding car, but by the engine at the front. Likewise, God, the ultimate Cause and Unmoved Mover, is responsible for the actualization of the potential: "this all men speak of as God" and "this we call God," Aquinas concluded in his *Summa Theologica* (I.2.3).[9]

Though superficially similar, the *Leibnizian* cosmological argument is crucially different from the Thomistic argument. Without grounding his argument in Aristotelian-Thomistic metaphysics, Leibniz started with the "first question which should rightly be asked"—namely, "Why is there something rather than nothing?"[10] To answer this question, he appealed to the Principle of Sufficient Reason: "No fact can be real or existent, no statement true, unless there be a sufficient reason why it is so and not otherwise."[11]

This is in stark contrast to Bertrand Russell's assertion that the existence of the universe is a brute fact: "The universe is just there, and that's all."[12] Leibniz rejected such an idea—not just for the universe but also for God. Contingent things exist by virtue of something independent of them. For example, all of the constituents or states of the universe are not self-explanatory, since they are contingent. An infinite regress of contingent events still does not account for the *entire* series of events—or all of the contingent entities comprising the universe. Simply stringing together contingent things does not thereby render them necessary. This would be like check-kiting: a person with no money in the bank writes Check A to take care of his pressing debts and then Check B to cover Check A, and so on. By contrast, God, a necessary being, is self-sufficient and self-explanatory, needing nothing outside himself to account for his existence. Indeed, necessary existence is bound up within his nature: as the greatest conceivable being, God cannot not exist. So in addition to being the sufficient reason for all contingent entities, God, by virtue of his own nature, is the sufficient reason for his own existence.

Though initially skeptical of Leibniz's version of the argument, Craig eventually came to formulate and defend a Leibnizian argument along the following lines:

I. Anything that exists has an explanation of its existence, either in the necessity of its own nature or in an external cause.
II. If the universe has an explanation of its existence, that explanation is God.
III. The universe exists.
IV. Therefore, the explanation for the universe's existence is God.[13]

But that is a story for another day; our interest lies in the third type of cosmological argument identified by Craig.

The KCA is the version of the cosmological argument that Craig found to lie behind Hackett's argument. "*Kalām,*" Arabic for "word," came to denominate the philosophical theology pursued by medieval Islamic scholastics. Proponents of this version of the argument, going all the way back to the Aristotelian commentator John Philoponus in pre-Islamic Alexandria, argued against the possibility of an infinite temporal regress of events—they held, rather, the universe came into being a finite time ago. The argument aims to show that an infinite temporal regress of events is impossible and that therefore the universe began to exist without a material cause. In conjunction with the causal principle that whatever begins to exist has a cause, this fact implies that the universe has a transcendent (efficient) cause of its existence.

The KCA

The Muslim philosopher al-Ghāzālī presented the KCA in this simple form: "Every being which begins has a cause for its beginning; now the world is a being which begins; therefore, it possesses a cause for its beginning."[14] Ghāzālī's argument is disarmingly simple:

1. Whatever begins to exist has a cause of its beginning.
2. The universe began to exist.
3. Therefore, the universe has a cause of its beginning.

If all goes well, once one has arrived at a transcendent cause of the beginning of the universe, a conceptual analysis of what it is to be a cause of the universe's beginning enables one to recover a number of striking attributes of such a cause, including timelessness, immateriality, and, ultimately, personhood.

Craig initially adopted Ghāzālī's formulation but more recently has observed that the argument's success does not depend on a premise so sweeping as (1), rather the more modest

1′. If the universe began to exist, the universe has a cause of its beginning.

will suffice and is even more perspicuously true. Although Craig has offered various arguments in defense of the causal premise, his interest clearly lies in (2). He has offered both deductive and inductive arguments in support of the key claim that the universe began to exist.

Deductive arguments

2.1 The deductive argument based on the impossibility of an actual infinite:
  2.11 An actual infinite cannot exist.
  2.12 An infinite temporal regress of events is an actual infinite.
  2.13 Therefore, an infinite temporal regress cannot exist.

2.2 The deductive argument based on the impossibility of the formation of an actual infinite by successive addition:
  2.21 A collection formed by successive addition cannot be actually infinite.
  2.22 The temporal series of past events is a collection formed by successive addition.
  2.23 Therefore, the temporal series of past events cannot be actually infinite.

Inductive arguments

2.3 The inductive argument based on the expansion of the universe
2.4 The inductive argument based on the thermodynamic properties of the universe

The first deductive argument is an expression of finitism. On Craig's Aristotelian view, the only infinite which can actually exist is the potential infinite, which is merely a limit concept, not a number. There are no examples of actual infinites in the concrete world, and the notion of the potential infinite suffices for the pursuit of modern science. But what about the abstract mathematical realm described by infinite set theory? Here the proponents of the KCA have either made an in-principle distinction between causally effete abstract objects and concrete objects, holding that the absurdities attending the existence of an actual infinite apply only to causally connected objects, or they, like Craig himself, adopt an antirealist view of such abstract objects, denying them existence in any metaphysically heavy sense.[15]

The second deductive argument serves to bring to the fore the theory of time, which underlies the KCA, namely a tensed, as opposed to tenseless, theory of time which affirms the objective reality of temporal becoming. Premise (2.22) presupposes that the series of temporal events does not exist tenselessly but comes into being *seriatim*. Therefore, the present event is reached by a genuine lapse of an actually infinite number of prior events one after another, if the universe is beginningless. This feature of an infinite past occasions manifold difficulties, famously exemplified in the thesis of Kant's First Antinomy concerning time. Lest one be tempted to avoid these difficulties by opting for a tenseless theory of time, Craig has argued at length in a pair of volumes for a tensed theory of time and against a tenseless theory.[16]

What is especially intriguing about the KCA's claim of the beginning of the universe is the scientific evidence to which Craig appeals from relatively recent discoveries pointing to the universe's temporal finitude. As indicated above, the two major inductive arguments supporting the second premise of the KCA are based on, first, the expansion of the universe and, second, the thermodynamic properties of the universe.

Consider, first, the evidence from the universe's expansion. In the 1920s, Alexander Friedmann and Georges LeMaître independently proposed an expanding universe and an edge to space-time. Their space-time model of a four-dimensional universe resembles a cone with a hard edge or boundary to the universe's beginning—and that of space, time, matter, and energy.[17] The standard Big Bang cosmological model describes the expansion of space itself—not simply matter within the universe. As we "reverse engineer" the universe and backtrack its trajectory toward zero, we arrive at a singularity—a boundary to space-time.

This beginning and expansion were confirmed by astronomer Edwin Hubble's observations that the spectral light from distant galaxies is red-shifted, indicating that the galaxies are receding from one another. In 1970, Hawking and Penrose affirmed in their Singularity Theorems that, given the assumption that the laws of General Relativity govern the universe, the universe began with an initial singularity.[18] In doing so, they removed any lingering considerations that the universe was eternal, whether this be according to the beginningless Steady-State Model or the Oscillating Model with an infinite past comprised expansions and contractions. Standard Big Bang cosmogony thus points to an absolute beginning of the universe: in the words of P. C. W. Davies, "most cosmologists think of the initial singularity as the beginning of the universe. On this view the big bang represents the creation event; the creation not only of all the matter and energy in the universe, but also of spacetime itself."[19] Thus, Hawking reports, "Almost everyone now believes that the universe, and time itself, had a beginning at the big bang."[20]

Of course, modifications of the standard model have been proposed. The Hartle-Hawking "no boundary" Quantum Gravity Model of the universe (1982) was put forth to bring together General Relativity and the world of quantum mechanics.[21] Instead of the hard-edged cone of Friedmann-LeMaître space-time model, this model proposes that, prior to Planck time, the initial stage of space-time resembled a badminton shuttlecock with a smooth, "rounded off" hemisphere without an edge. So there is no definite point of creation, even though time is still finite in the past. In his popular *Brief History of Time* (1988), Hawking would ask "What place, then, for a creator?"[22] Yet even on the Quantum Gravity model, time still began to exist, even if not at a singularity, as Hawking himself later acknowledges in his *The Grand Design* (2010).[23] In fact, the more generalized Borde-Guth-Vilenkin Theorem (2003) proved that any universe which is, on average, in a state of cosmic expansion cannot be infinite in the past but must have had a beginning.[24]

The beginning of the universe—and matter, energy, space, and time—raises significant metaphysical questions regarding its cause. Again, Davies spells out what he takes to be the only options:

> "What caused the big bang?" . . . One might consider some supernatural force, some agency beyond space and time as being responsible for the big bang, or one might prefer to regard the big bang as an event without a cause. It seems to me that we don't have too much choice. Either . . . something outside of the physical world . . . or . . . an event without a cause.[25]

A second body of scientific evidence considered to support the beginning of the universe looks to the implications of its thermodynamic properties. The second law of thermodynamics states that a closed universe, with its limited amount of energy, will always move toward increased entropy. A hot object tends toward becoming a cooler object; energy inclines toward dissipation or disorder. Since the universe is winding down and, given enough time, will experience a heat death of some sort, it cannot be eternal. If the universe were eternal, why has this heat death not already occurred?

Rather than moving from a Big Bang to—as had been relatively recently assumed—a Big Crunch, in which the universe would contract and collapse back in on itself, the universe will continue to expand but move toward a cosmic Black Death, as it were. It will move toward a state of increasing coldness, disintegration, and deadness, with nothing left to show for it besides a dilute gas of fundamental particles and radiation. But if, given enough time, the universe will find itself in such a lifeless state, then it is exceedingly puzzling why, given infinite past time, the universe is not now in such a state. The most obvious solution is that the problem is based on a false assumption, namely that the universe is beginningless. Given that the universe is winding down, then in some way, as physicist Richard Schlegel acknowledges, "the universe must have been *wound up.*"[26]

So both the expansion of the universe and the second law of thermodynamics seem to point to the universe's finitude, thus offering empirical confirmation of the philosophical, deductive arguments in support of the key premise of the KCA.

This two-volume collection

As mentioned, there has been in recent decades a resurgence of interest in the KCA. A plethora of journal articles as well as entire books have been devoted to the discussion of its premises. It has now attracted the attention of physicists as well as philosophers and has found its way even into scientific journals. The time seems therefore ripe for an anthology gathering some of the disparate literature under one cover. Indeed, the breadth of the KCA literature calls for two companion volumes, one devoted to the philosophical arguments and the other to the scientific evidences. Apart from Craig and Smith's earlier co-authored *Theism, Atheism, and Big Bang Cosmology* (Clarendon Press, 1993), a brisk seller which remains in print today, there has been to date no collection or anthology devoted exclusively to a discussion of the KCA. This two-part anthology seeks to remedy that lack. It is a collection of the best recent work, both philosophical and scientific, on the premises and conclusion of the KCA.

For those who have followed the KCA, the chapters in this anthology—several of them new—will cover the familiar-sounding Hilbert's Hotel, the Tristram Shandy and Grim Reaper paradoxes, Cantorian set theory, and transfinite arithmetic—as well as Big Bang cosmology, the universe's expansion, and the second law of thermodynamics. Moreover, the authors of the various chapters include both KCA advocates or sympathizers and those who contest and challenge it.

Chapter summaries of *The Kalām Cosmological Argument: Philosophical Arguments for the Finitude of the Past*

Whereas the companion to this volume concerns the *scientific* support for the second premise of the KCA, as well as the argument's conclusion that a personal creator exists, this volume introduces the first premise of the KCA as well as its *philosophical* arguments against an infinite past.

In Part 1, which focuses on the causal premise of the KCA, Adolf Grünbaum (Chapter 1) leads off the anthology by challenging Leibniz's question with the counterquestion: "But why should there be just nothing, rather than something?" He disputes the "normalcy of nothingness" which he believes is presupposed by the Leibnizian and *kalām* arguments. He appeals to the role of simplicity in scientific explanations, which purportedly undermines the KCA. He also challenges the appropriation of teleology (the Anthropic Principle) and Richard Swinburne's use of Bayes's theorem to support the probability of God's existence.

In Chapter 2, William Lane Craig offers his rebuttal to Grünbaum, asserting that Grünbaum's claim that the Leibnizian and *kalām* arguments presume the "normalcy of nothingness" is simply false and that these two versions of the cosmological argument can readily withstand his critique.

Part 2 of the collection brings us to the first deductive argument for the universe's beginning, which is based on *the Impossibility of the Existence of an Actual Infinite*. In Chapter 3, Wes Morriston examines *a priori* arguments as he seeks to answer the question, "Must metaphysical time have a beginning?" He contends that neither of the deductive arguments succeeds. Further, if the complete future is known to God, then this must constitute an actual infinite, which would undermine the KCA. In Chapter 4 by Morriston, he claims that the defender of the KCA incorrectly insists that actual infinity cannot be applied to the "real world" and that examples of alleged absurdities proffered by defenders like Craig are not successful.

Challenging Morriston's criticisms and dismissals of the KCA is David S. Oderberg in his new work, "No Beginning, No Explanation: The *Kalām* Cosmological Argument and the Principle of Sufficient Reason" (Chapter 5). A serious problem for the idea of a beginningless past is its violation of the Principle of Sufficient Reason (PSR). Critics like Morriston deny this is problematic, and Oderberg formulates a version of PSR that is minimally sufficient for the argument against an infinite past to work. He expounds and defends this, attempting to show that this solid support for the KCA—an *a priori* argument against a beginningless past based on PSR—remains unshaken.

Chapter 6 presents Graham Oppy's excerpt from his book *Arguing about Gods*. He challenges the KCA as articulated by Craig, finding it unpersuasive. He claims that there is nothing in Craig's major syllogism nor in the supporting arguments he advances on behalf of the premises of his major syllogism that should persuade any reasonable person not already convinced of the conclusion of that syllogism that the universe had a cause for its existence. In Chapter 7, Craig's work engages with Oppy's criticisms of the KCA.

Landon Hedrick's work "Heartbreak at Hilbert's Hotel" (Chapter 8) challenges one of Craig's illustrations—the "Hilbert's Hotel argument"—in support of the second premise of the KCA. The proponent of the argument attempts to show that accommodating an infinite number of hotel guests in an infinite number of hotel rooms leads to all manner of absurdities. Hedrick challenges the assertion that, given the metaphysical absurdity of the existence of an actually infinite number of entities, this precludes a beginningless past. Craig's arguments are no challenge to the presentist, who believes that—unlike the present—events past or future cannot be considered real. However, in Chapter 9, Andrew Loke's "No Heartbreak at Hilbert's Hotel" responds to Hedrick by arguing one must consider the way the hotel and persons are constructed and generated: one can suppose there exists a hotel room builder and a customer generator, which have been building hotel rooms and generating customers at regular time intervals as long as time exists. Then the actual infinity of hotel rooms and customers do exist simultaneously after they have been built and generated, respectively.

Chapter 10, Stephen Puryear's recent work "Finitism and the Beginning of the Universe," closes out the discussion of the first deductive argument and transitions to the second. He argues against the claim that the past must be finite and that if it were infinite, then we could never reach the present moment since this would entail a traversal of an infinite series of events. For infinite sequences are traversed in reality as we, for example, move from one spatial location to another. Puryear here addresses one reply to this objection—namely, the claim that actual infinities are not traversed in nature because space, time, and other continuous wholes divide into parts only in so far as we divide them in thought, and, thus, divide into only a finite number of parts.

Chapter 11 brings the philosophical volume of the anthology to the second deductive argument supporting premise 2: *The Argument Based on the Impossibility of the Formation of an Actual Infinite by Successive Addition*. Oderberg evaluates the KCA's claim that an infinite cannot be formed by successive addition, and thus traversed, as well as the claim that whatever begins to exist must have a cause to its beginning.

Chapter 12 by Graham Oppy responds to an illustration used by KCA defenders to show the impossibility of traversing an infinite—namely, the Tristram Shandy Paradox. Tristram Shandy, a character in a novel by Lawrence Sterne, was appropriated by Bertrand Russell to illustrate a paradox: Shandy is writing his autobiography, but it takes him one year to write down one day's events. If Shandy lived forever, he would fall further and further behind. Yet Russell claimed that no part of Shandy's autobiography would remain unwritten, since the number of future years and the number of future days are the same. Oppy claims that some of various stories surrounding this paradox are clearly self-contradictory while others are not. Then, in Oderberg's surrejoinder to Oppy on this paradox (Chapter 13), he attempts to show, point for point, that Oppy's criticisms do not succeed in undermining his claims.

In Chapter 14, Ben Waters discusses the literature on the developing lines of argument surrounding the Tristram Shandy Paradox. He attempts to show that the refining of this argument over the years has more clearly revealed the absurdity of the actual infinite, and he seeks to advance one of his own arguments to fill remaining gaps in the argument, so as to yield a new argument for the finitude of the past.

Robert Koons, who has developed a new *kalām* argument appropriating José Benardete's Grim Reaper Paradox, brings us an original work for this volume: "The Grim Reaper *Kalām* Argument: From Temporal and Causal Finitism to God" (Chapter 15). This paradox envisions a potentially infinite number of Grim Reapers. A person is alive at midnight. Grim Reaper #1 will strike this mortal dead at 1:00 a.m. if he is still alive then. Grim Reaper #2 will strike him dead at 12:30 a.m. if he is still alive at this time. Grim Reaper #3 will do so at 12:15 a.m., and so forth. If we can conceive of an actually infinite number of things as possible, this scenario nevertheless creates the following contradiction: our mortal cannot live past midnight and yet cannot be struck down by any Grim Reaper at any time. In Koons's work, after noting the significant intuitive weight of the first premise of the KCA, he focuses on the second premise, describing and utilizing this paradox to defend both the finitude of the past and the thesis of causal finitism, which points in the direction of an eternal first cause with godlike characteristics.

In Chapter 16, Yishai Cohen, following the lead of Morriston, points to a "persistent thorn" in the KCA—namely, the prospects of an endless future. If the past cannot be beginningless because of problems with actual infinites, then the same impossibility must hold for the purported endlessness of the future. In response to such arguments by Morriston and Puryear, Andrew Loke presents a response in his new work "On the Beginning of Time: A Reply to Wes Morriston Concerning the Existence of Actual Infinities" (Chapter 17). Loke takes the route of distinguishing between abstract and concrete infinites, insisting that "the problem with certain kinds of concrete infinities is related to the fact that the members of the set are embedded in a network of causal relations *and* which involve the violation of metaphysical necessary truth. Since an actual infinite of abstract entities are not embedded in a network of causal relations and do not involve such violations, the realm of abstract objects is exempted."

The final chapter in the first anthology volume addressing the second deductive argument of the KCA is by Craig (Chapter 18). Here he reviews and responds to some of the most recent philosophical developments in the discussion of the KCA, including Puryear's and Cohen's arguments.

It is my hope that this and its companion volume will serve well those who are upper-level philosophy students and professors engaging in philosophy of religion, philosophical theology, and the dialogue between science and theology. But those involved in the following disciplines and areas of study will also profit from engaging in this conversation: Cosmogony, Astrophysics, Physics (time, space, causality, thermodynamics), Philosophy of science, Mathematics (Cantorian set theory, infinity), Metaphysics (abstract objects, agent causation), and Theology (the doctrine of God, creation, divine agency).

Notes

1 London: Macmillan, 1979.

2 "Kalam Cosmological Arguments for Atheism," in *The Cambridge Companion to Atheism*, ed. Michael Martin (Cambridge: Cambridge University Press, 2007), 183.

3 As further indication of a strong interest in the KCA, an anthology of essays on the KCA is being published in Arabic by Jamalon Publishers (2017). So far as I can tell, several of the same outstanding articles that I have selected will be translated into Arabic for that volume.

4 A beloved professor who became a dear friend to both Craig and me, Hackett was a brilliant, eccentric, amiable teacher and a very capable philosopher noted for his paragraph-long, Germanic-style sentences. He had been Craig's professor at Wheaton College, Illinois, and Craig would later become Hackett's colleague at Trinity Evangelical Divinity School. I had the privilege of studying under both these scholars, writing my M.A. thesis at Trinity on the KCA under the supervision of Hackett as my first reader.

5 Originally published by Moody Press of Chicago, the book has since been republished by Wipf and Stock (2009).

6 Hackett's follow-up defense of the Christian revelation claim also propounds this argument: *The Reconstruction of the Christian Revelation Claim: A Philosophical and Critical Apologetic* (Eugene, OR: Wipf and Stock, 2009), 98–103. This book was previously published by Baker Book House in 1984.

7 Stuart C. Hackett, *The Resurrection of Theism* (Eugene, OR: Wipf and Stock, 2009), 293–94.

8 *The Cosmological Argument from Plato to Leibniz* (London: Macmillan, 1979).

9 Thomas Aquinas, *Summa Theologica* in *Introduction to St. Thomas Aquinas*, ed. Anton Pegis (New York: Modern Library, 1948).

10 G. W. Leibniz, "The Principles of Nature and of Grace, Based on Reason," in *Leibniz Selections,* ed. P. Wiener (New York: Charles Scribner's Sons, 1951), 527.

11 G. W. Leibniz, "The Monadology," in *Leibniz Selections,* 539.

12 Bertrand Russell and Frederick Copleston, "The Existence of God," *The Existence of God*, ed. John Hick (New York: Macmillan, 1964), 175.

13 *Is Faith in God Reasonable?* With Alex Rosenberg. Ed. Paul Gould and Corey Miller, R*outledge Studies in the Philosophy of Religion* (London: Routledge, 2014).

14 Al-Ghazali, *Kitab al-Iqtisad fi'l-Iqtiqad* (Ankara: University of Ankara Press, 1962), 15–16.

15 *God Over All: Divine Aseity and the Challenge of Platonism* (Oxford: Oxford University Press, 2016); *God and Abstract Objects: The Coherence of Theism III: Aseity* (Berlin: Springer Verlag, 2017).

16 *The Tensed Theory of Time: A Critical Examination*, Synthese Library 293 (Dordrecht: Kluwer Academic Publishers, 2000); *The Tenseless Theory of Time: A Critical Examination*, Synthese Library 294 (Dordrecht: Kluwer Academic Publishers, 2000).

17 A. Friedmann, "Über die Krümmung des Raumes," *Zeitschrift für Physik* 10 (1922): 377–86; G. Lemaître, "Un univers homogène de masse constante et de rayon croissant, rendant compte de la vitesse radiale des nébuleuses extragalactiques," *Annales de la Société scientifique de Bruxelles* 47 (1927): 49–59.

18 R. Penrose, "Gravitational Collapse and Space-Time Singularities," *Physical Review Letters* 14 (1965): 57–59; S. W. Hawking and R. Penrose, *The Large-Scale Structure of Space-Time,* ed. S. W. Hawking and G. F. R. Ellis (Cambridge: Cambridge University Press, 1973), 266.

19 P. C. W. Davies, "Spacetime Singularities in Cosmology," in *The Study of Time III,* ed. J. T. Fraser (New York: Springer Verlag, 1978), 78–79.

20 Stephen Hawking and Roger Penrose, *The Nature of Space and Time,* The Isaac Newton Institute Series of Lectures (Princeton, NJ: Princeton University Press, 1996), 20.
21 S. Hawking and J. Hartle, "The wave function of the universe," *Physical Review D* 28 (1983): 12, 2960–75.
22 Stephen Hawking, *A Brief History of Time* (New York: Bantam, 1988), 141.
23 Leonard Mlodinow and Stephen Hawking, *The Grand Design* (New York: Bantam, 2010).
24 A. Borde, A. Guth, and A. Vilenkin (2003): "Inflationary Spacetimes are not Past-complete," *Physical Review Letters* (2003): 90, 151301, preprint: http://arxiv.org/abs/gr-qc/0110012.
25 Paul Davies, "The Birth of the Cosmos," in *God, Cosmos, Nature and Creativity*, ed. Jill Gready (Edinburgh: Scottish Academic Press, 1995), 8–9.
26 Richard Schlegel, "Time and Thermodynamics," in *The Voices of Time*, ed. J. T. Fraser (London: Penguin, 1948), 511.

Part One

Whatever Begins to Exist Has a Cause

1

A New Critique of Theological Interpretations of Physical Cosmology

Adolf Grünbaum

1 Introduction

In Richard Gale's ([1991]) book *On the Nature and Existence of God,* he devotes a very penetrating chapter ([1991], Ch. 7) to a critique of cosmological arguments for the existence of God, after giving a generic characterization of all such arguments. As is well known, there are different species of such arguments. But Gale reaches the following negative verdict on the genus (p. 284):

> My two arguments [. . .] constitute ontological disproofs of the existence of the very sort of being whose existence is asserted in the conclusion of every version of the cosmological argument, thereby showing that these arguments are radically defective. These ontological disproofs, however, do not pinpoint the defective spot in these arguments.

My *initial* aim in this paper is precisely to pinpoint the defects of the time-honored arguments for perpetual divine creation given by a succession of theists including Aquinas, Descartes, Leibniz, Locke, as well as by the present-day theists Richard Swinburne and Philip L. Quinn. One of these defects will also turn out to vitiate a pillar of the medieval Arabic *kalām* argument for a creator (Craig [1979]).

2 The nonexistence of the actual world as its purported 'natural' state

2.1 Swinburne and Leibniz on the normalcy of nothingness

In Richard Swinburne's extensive writings in defense of (Christian) theism, notably in his books ([1991], [1996]), he presents two versions of his argument for his fundamental thesis that 'the most natural state of affairs of the existing world and even of God is *not* to exist *at all*!' As he put it ([1996], p. 48): 'It is extraordinary that

there should exist anything at all. Surely the most natural state of affairs is simply nothing: no universe, no God, nothing. But there is something.' It will be expeditious to deal first with the more recent ([1996]) version of his case, and then with his earlier ([1979], [1991]) substantial articulation of Leibniz's argument from *a priori* simplicity.

Surprisingly, Swinburne deems the existence of something or other to be 'extraordinary', i.e. literally out of the ordinary. To the contrary, surely, the most pervasively ordinary feature of our experience is that we are immersed in an ambiance of existence. Swinburne's initial assertion here is, at least *prima facie,* a case of special pleading in the service of a prior philosophical agenda. Having made that outlandish claim, Swinburne builds on it, averring that 'surely the most natural state of affairs is simply nothing.' Hence he regards the cosmic existential question 'Why is there anything at all, rather than just nothing?' as paramount.

As we know, the Book of Genesis in the Old Testament starts with the assertion that, in the beginning, God created heaven and earth from scratch. And, as John Leslie ([1978], p. 185) pointed out, 'when modern Western philosophers have a tendency to ask it [i.e. the existential question above], possibly this is only because they are heirs to centuries of Judaeo-Christian thought.' This conjecture derives added poignancy from Leslie's observation that 'To the general run of Greek thinkers the mere existence of a thing [or of the world] was nothing remarkable. Only their changing patterns provoked [causal] inquisitiveness.' And Leslie mentions Aristotle's views as countenancing the acceptance of 'reasonless existence'.

Yet there is a long history of sometimes emotion-laden, deep puzzlement, even on the part of atheists such as Heidegger, about the mere existence of our world (Edwards [1967]). Thus, Wittgenstein ([1993], p. 41) acknowledged the powerful *psychological* reality of wondering at the very existence of the world. Yet logically, he rejected the question altogether as 'nonsense', because he 'cannot imagine its [the world's] not existing' (pp. 41–42), by which he may perhaps have meant not only our world, but more generally, as Rescher ([1984], p. 5) points out, some world or other. Wittgenstein could be convicted of a highly impoverished imagination, if he could not imagine the nonexistence of just our particular world.

Before turning to the logical aspects of the cosmic existential question, let me mention a psychological conjecture as to why not only theists, but also some atheists, find that question so pressing. For example, Heidegger ([1953], p. 1) deemed 'Why is there anything at all, rather than just nothing?' the most fundamental question of metaphysics. Yet he offered no indication of an answer to it, and he saw its source in our facing nothingness in our existential anxiety.

I gloss this psychological hypothesis as surmising that our deeply instilled fear of death has prompted us to wonder why we exist so precariously. And we may then have extrapolated this precariousness, more or less unconsciously, to the existence of the universe as a whole.

Psychological motivations aside, let me recast Swinburne's aforecited statement 'The most natural state of affairs is simply nothing' to read instead 'The most natural state of the existing world is to *not* exist at all'. This reformulation avoids the hornet's

nest inherent in the question as to the sheer intelligibility of utter nothingness *qua* purportedly *normal state* of our world.[1]

Yet my reformulation is still conceptually troublesome: How can *non*-existence at all be *coherently* a state, natural or otherwise, of the actual, existing world? Swinburne speaks vaguely of 'the most natural state of affairs', leaving it unclear whether his 'state of affairs' pertains only to our actual world or also to any other logically possible world that might have existed instead. But it is clear that he has in mind *at least* our actual world, in which case my reformulation of his claim is incoherent and not helpful. The stronger claim pertaining to any alternative world as well was perhaps intended by Derek Parfit ([1998]), who wrote (p. 24): 'why is there a Universe at all? It might have been true that nothing ever existed: no living beings, no stars, no atoms, not even space or time [. . .] No question is more sublime than why there is a Universe: why there is anything rather than nothing.'

No matter whether one is considering Swinburne's original formulation, or Parfit's 'It might have been true that nothing existed', it is surely epistemically appropriate to ask for the grounds on which Swinburne and Parfit respectively rests his assertion. Parfit does not tell us, whereas Swinburne does. Therefore, I shall scrutinize Swinburne's argument for it, and also Leibniz's.

I shall offer my own reasons for endorsing Henri Bergson's injunction as follows: We should never assume that the 'natural thing' would be the existence of nothing. He rested this proscription on grounds radically different from mine, when he declared: 'The presupposition that *de jure* there should be nothing, so that we must explain why *de facto* there is something, is pure illusion.'[2] But Bergson's reasons for charging illusoriness are conceptual and *a priori,* whereas mine will turn out to be empirical.

As we know, a long theistic tradition has it that this *de jure* presupposition is correct *and* that there must therefore be an explanatory cause *external* to the world for its very existence; furthermore, it is argued that this external cause is an omnipotent, omnibenevolent and omniscient personal God.

But, in outline, my challenge to this reasoning will be as follows: (i) In this context, the question 'What is the *external* cause of the very existence of the universe?' is avowedly predicated on the doctrine that, in Swinburne's words, 'Surely the most natural state of affairs is simply nothing'; (ii) Yet, as I shall argue in detail, just this doctrine is ill-founded, contrary to the arguments for it offered by Leibniz and Swinburne; and (iii) Therefore, the question calling for an external cause of the very existence of the world is a *non-starter,* i.e. it poses a *pseudo-problem.* By the same token, the answer that an omnipotent God is that cause will turn out to be ill-founded.

What are the appropriate grounds for gleaning what is indeed the natural, spontaneous, normal state of the world in the absence of an intervening external cause? In opposition to an *a priori* conceptual dictum of naturalness, I have previously argued from the history of science that changing evidence makes the verdict inevitably *empirical* rather than *a priori* (Grünbaum [1996], [1998]). Here, a summary will have to suffice.

I welcome Swinburne's use of the phrase 'natural state of affairs' ([1996], p. 48), which dovetails with the parlance I used, when I elaborated on the notion of 'natural state' by speaking of it as the 'spontaneous, externally undisturbed, or normal' state. In

essence, Swinburne's claim that 'the most natural state of affairs is simply nothing' had been enunciated essentially by Aquinas, Descartes, Leibniz, and a host of other theists. Hereafter, I shall designate this thesis as asserting 'the spontaneity of nothingness', or 'SoN' for brevity.

In my parlance, the terms 'natural', 'spontaneous', 'normal', and 'externally unperturbed' serve to characterize the historically dictated *theory-relative* behavior of physical and biological systems, when they are not subject to any *external* influences, agencies or forces. In earlier writings (Grünbaum [1954], [1990], [1996], [1998]), I called attention to the *theory-relativity* of such naturalness or spontaneity by means of several examples from physics and biology.

Thus, I pointed out ([1996], [1998], sections 3 and 4) that the altogether 'natural' behavior of suitable subsystems in the now defunct original Bondi & Gold Steady-State World is as follows: Without any interference by a physical influence external to the subsystem, let alone by an external matter-*creating* agency or God, matter pops into existence spontaneously in violation of Lavoisier's matter-conservation. This spontaneous popping into existence follows deductively from the conjunction of the theory's postulated matter-*density*-conservation with the Hubble law of the expansion of the universe. For just that reason, I have insisted on the use of the *agency-free* term 'matter-accretion' to describe this process, and have warned against the use of the *agency-loaded* term 'matter-*creation*'.

In the same vein, I emphasized that according to Galileo and to Newton's first law of motion, it is technically '*natural*' that a *force-free* particle moves uniformly and rectilinearly, whereas Aristotle's physics asserted that a force is required as the external cause of any sublunar body's non-vertical uniform rectilinear motion. In short, Aristotle clashed with Galileo and Newton as to the 'natural', spontaneous, dynamically unperturbed behavior of a body, which Aristotle deemed to be one of rest at its proper place. Thus, Galileo and Newton *eliminated* a supposed external dynamical cause on *empirical* grounds, explaining that uniform motion can occur spontaneously without such a cause.

But, if so, then the Aristotelian demand for a causal explanation of any non-vertical motion whatever by reference to an external perturbing force is predicated on a false underlying assumption. Clearly, the Aristotelians then begged the question by tenaciously continuing to ask: 'What net external force, pray tell, keeps a uniformly moving body going?' Thus, scientific and philosophical questions can be anything but innocent by loading the dice with a *petitio principii*!

An example from biology yields the same lesson. It has been said that Louis Pasteur 'disproved' the 'spontaneous' generation of life from nonliving substances. Actually, he worked with sterilized materials over a cosmically minuscule time-interval, and showed that bacteria in an oxidizing atmosphere would not grow in these sterilized materials. From this he inferred that the natural, unperturbed behavior of *nonliving* substances *precludes* the spontaneous generation of living things. That was in 1862. But in 1938, A. I. Oparin in the then Soviet Union, and in 1952, H. Urey in the United States rehabilitated the hypothesis of the spontaneous generation of life to the following effect: Life on earth originated by spontaneous generation under favorable conditions

prevailing some time between 4.5 billion years ago and the time of the earliest fossil evidence 2.7 billion years ago. I have summarized this rehabilitation as follows ([1973], pp. 573–74):

> When the earth was first formed, it had a reducing atmosphere of methane, ammonia, water, and hydrogen. Only at a later stage did photochemical splitting of water issue in an oxidizing atmosphere of carbon dioxide, nitrogen and oxygen. The action of electric discharges or of ultra-violet light on a mixture of methane, ammonia, water, and hydrogen yields simple organic compounds such as amino acids and urea, as shown by work done since 1953 [footnote omitted]. The first living organism originated by a series of non-biological steps from simple organic compounds which reacted to form structures of ever greater complexity until producing a structure that qualifies as living.

Indeed, in a new book, Paul Davies ([1999]) has argued persuasively that progress in biology and astronomy is transforming the one-time mystery of the origin of life into a soluble problem. The clash between the inferences drawn by Pasteur, on the one hand, and by Oparin and Urey, on the other, provides a biological illustration of the theory-dependence of the 'natural', spontaneous behavior of a system, just as the theory-shifts from Aristotle to Galileo, and from matter-energy conservation to matter-accretion provide vivid illustrations from physics. And in each case, *empirical evidence* was required to justify the avowed naturalness.

As illustrated by the ill-conceived question put to Galileo by his Aristotelian critics, it is altogether misguided to ask for an external cause of the *deviations* of a system from the pattern that an empirically discredited theory tenaciously affirms to be the 'natural' one (Grünbaum [1973], pp. 406–7).

The proponents of SoN have not offered any empirical evidence for it. Yet the lesson of the history of science appears to be that just such evidence is required. However, some of the advocates of SoN have offered an *a priori* conceptual argument in its defense. I now turn to their defense.

2.2 Leibniz's and Swinburne's simplicity argument for the normalcy of nothingness

The imposition of *a priori* notions of naturalness is sometimes of-a-piece with the imposition of tenaciously held criteria of the mode of scientific explanation required for understanding the world. The demise of Laplacean determinism in physics, and its replacement by irreducibly stochastic, statistical models of micro-physical systems, is a poignant case of the empirical discreditation of a tenacious demand for the satisfaction of a previously held ideal of explanation: It emerges *a posteriori* that the universe just does not accommodate rigid prescriptions for explanatory causal understanding that are rendered otiose by a larger body of evidence.

Relatedly, the stochastic theory of radioactive decay in nuclear physics, for example, runs counter to Leibniz's demand for a 'sufficient reason' for all logically contingent

states of affairs. Thus, since the existence of our actual world is logically contingent, he insisted that there must be a sufficient reason for its existence.

2.2a Leibniz's simplicity argument

I now cite this demand in context from Leibniz's ([1714]) essay, 'The Principles of Nature and of Grace Based on Reason':

> 7. Thus far we have spoken as simple *physicists*: now we must advance to *metaphysics,* making use of the great principle, little employed in general, which teaches that *nothing happens without a sufficient reason;* that is to say that nothing happens without it being possible for him who should *sufficiently understand* things, to give a reason sufficient to determine why it is so and not otherwise. This principle laid down, the first question which should rightly be asked will be, *why is there something rather than nothing?*

To justify this question, he now resorts to an *a priori* argument from simplicity:

> For *nothing is simpler and easier than something.* Further, suppose that things must exist, we must be able to give a reason *why they must exist so* and not otherwise.
>
> 8. Now this sufficient reason for the existence of the universe cannot be found *in the series of contingent things* [. . .] (Wiener [1951], p. 525; most of the italics in original except for the one sentence 'nothing is simpler and easier than something').

Contextually, Leibniz implicitly enunciated SoN, when he declared that 'nothing is simpler and easier than something'. Having thus assumed SoN by recourse to *a priori* simplicity, he is in a position to reason as follows about the different states of the world:[3]

> every subsequent state is somehow copied from the preceding one (although according to certain laws of change). No matter how far we may have gone back to earlier states, therefore, we will never discover in them a full reason why there should be a world at all, and why it would be such as it is. Even if we should imagine the world to be eternal, therefore, the reason for it would clearly have to be sought elsewhere [. . .]

As for Leibniz's claim that 'nothing is *simpler* and *easier* than something' (italics added), I ask: But why is this *conceptual* claim, if granted, mandatory for what is the ontologically spontaneous, externally undisturbed state of the *actual* world? Alas, Leibniz does not tell us here. Yet, as I argued in Section **2.1** above, according to our best scientific knowledge, spontaneity is relative to changing *empirically-based* scientific theories.

Furthermore, Philip Quinn has, in effect, issued an important demurrer (private communication): Let us suppose that the purported state of nothingness is conceptually

non-elusive and the most simple. Then it would still not follow from this maximum conceptual simplicity that SoN is the simplest *hypothesis* within the set of all logically possible hypotheses, a set that we do not encompass intellectually. In short, conceptual simplicity does not necessarily bespeak theoretical simplicity, as Quinn has illustrated for this context by the following example:

> Suppose the purpose of an hypothesis is to explain how the observed universe is produced from a postulated initial state. Perhaps the hypothesis that postulates the most simple initial state will be forced to postulate a complex productive mechanism in order to achieve its explanatory purpose, while the same purpose can be achieved by a rival that postulates a slightly less simple initial state together with a vastly simpler productive mechanism. In such a case the hypothesis that postulates the most simple initial state will not be the hypothesis with the greatest overall simplicity.

The moral of this sketchy history is twofold: (i) The character of just what behavior of the actual world and of its subsystems is 'natural' is an empirical *a posteriori* matter, rather than an issue that can be settled *a priori*; yet (ii) SoN has no *empirical* credentials at all, as acknowledged, in effect, by the purely conceptual arguments for it which have been offered by its recent defenders.

Given this empiricist moral, I must dissent from Leslie's ([1998], p. 2) view that beliefs about the natural state of the universe are matters of 'intuition'. Says he: 'intuitions about what should be viewed as a universe's "natural state"—where this means something not calling for explanation by a divine person or any other external factor—can be defended or attacked only very controversially.' As I have argued, however, the naturalness or spontaneity of the states of physical and biological systems or of the cosmos is epistemologically a matter of empirical evidence and not of the conflict of personal intuitions regarding naturalness.

But the question could be and has been asked why this form of 'scientism' should be mandatory. Friedrich von Hayek (1952) and his acolytes have characterized scientism as a doctrine of explanatory scientific imperialism with utopian pretensions. Much more precisely, Richard Gale and Alexander Pruss ([in press]) defined scientism as implying that everything that *is* explained is explained by either science or some kind of explanation having strong affinities to actual scientific explanation. Thus, in their construal, scientism is not taken to assert that everything is explained by science *tout court,* but only that everything that is actually explained, is explained by science.

It is easy enough, as theists like Leibniz, Swinburne and Philip L. Quinn ([1993]) have done, to disavow scientism as just defined, although Swinburne insists ([1991]) that his version of theism is methodologically of-a-piece with various modes of scientific inference, such as the use of Bayes's theorem to credibilify scientific hypotheses. And he then marshals that theorem to aver that God probably exists.

But such a theistic disavowal of scientism calls for a potent justification of the theistic explanatory alternative. The most prominent alternative that theists have

proffered is modeled on volitional agency-explanations of human actions, as distinct from ordinary event-causation.

Yet in Section **3,** I shall argue that a divine volitional explanation of the actual topmost or most fundamental laws of nature, of their constants, and of the pertinent boundary or initial conditions founders multiply.

2.2b Swinburne's simplicity argument

With no help from Leibniz toward a cogent defense of SoN by reference to simplicity, I turn to Swinburne's quite general argument from simplicity for which he claims multiple sanction from science ([1996]). And I note first that he claims probity for his appeal to simplicity by maintaining that it has 'the same structure' as the use of simplicity in scientific theorizing. In his words:

> The structure of a cumulative case for theism was thus, I claimed [in *The Existence of God*], the same as the structure of a cumulative case for any unobservable entity, such as a quark or a neutrino. Our grounds for believing in its existence are that it is an entity of a simple kind with simple modes of behavior which leads us to expect the more complex phenomena which we find.[4]

Furthermore, having argued that an infinite capacity is simpler than any one finite capacity, Swinburne ([1991], Ch. 5, [1996], Ch. 3) contends that in a rank-ordering of graduated properties, God's omnipotence, omniscience and (presumably) omni-benevolence are the simplest. Hereafter, I shall refer to this triad as 'God's triplet of *omnis*'. He puts his case for the simplicity of this triplet as follows ([1991], p. 322):

> The postulation of God [. . .] is the postulation of *one* entity of a simple kind, the simplest kind of person there could be, having no limits to his knowledge, power, and freedom.

Yet Swinburne ([1996], p. 48) had also told us that a natural state of nothingness *without God* is simpler than a world containing God. And furthermore, he deems the cardinal number zero of entities simpler than the number 1 for which he just claimed simplicity *vis-à-vis* a larger cardinal.

Occam's injunction, as symbolized by his razor, is to abstain from postulating entities beyond necessity. Mindful of this prescription, Swinburne ([1991], p. 84) characterizes the simplicity and complexity of hypotheses in terms of the *number* of entities, the sorts of entities, and the kinds of relations among entities that they postulate. But clearly, in scientific theorizing, the regulative ideal of Occam's razor is subject to the crucial proviso of heeding the total available evidence, including its complexity.

Thus, it now turns out that there were important episodes in the history of actual science, in which increasingly greater theoretical faithfulness to the facts required the *violation* of Swinburne's *a priori* criterion of simplicity with respect to the number of postulated entities. Thus, such numerical simplicity as can be achieved while explaining

the phenomena is an empirical matter, and not subject to Swinburne's legislative *a priori conceptual* simplicity.

Ironically, this lesson is spelled by one of his own examples. In his view, the putative infinite speed of a particle is simpler than some finite value. Yet the velocity of light is known to be finite, and the special theory of relativity tells us that this finite velocity is an upper bound for the transmission of any causal influence. Other examples from actual science that violate Swinburne's mandate of conceptual simplicity abound. Let me enumerate some of them.

(i) By Swinburne's normative criterion of numerical simplicity, the pre-Socratic Thales's monistic universal hydro-chemistry of the world's substances is about a hundredfold simpler than the empirically discovered periodic table of the elements. And there are even two isotopes of Thales's water, one heavier than the other. Furthermore, in organic chemistry, isomerism is a complication. Moreover, the single frequency of monochromatic light is simple for Swinburne, but ubiquitous white light is composed of a whole range of spectral frequencies.

(ii) Yet again, suppose that fundamental physics were reduced to the well-known quadruplet of forces, then these four forces are numerically less simple than a single such force, not to speak of Swinburne's much simpler number zero of them. *Evidently, our world does not accommodate a priori conceptual decrees of simplicity*! Thus, it is unavailing for Swinburne to tell us ([1991], pp. 283–84): 'If there is to exist something, it seems impossible to *conceive* of anything simpler (and therefore *a priori* more probable) than the existence of God' (italics added). But Swinburne has not shown cogently that greater *conceptual* simplicity automatically makes for greater *a priori* probability.

Indeed, this claim boomerangs, as Keith Parsons ([1989], p. 84) has pointed out as follows:

> A demon, for instance [especially Satan], is a single entity, it is a spiritual being and hence not composed of parts; it presumably exercises its power over persons and physical objects in some direct and simple way, and it is in all its deeds actuated by a single motivating drive—malevolence. Hence, explanation of a case of psychosis in terms of demon[ic] possession seems much simpler than any of the current psychological or neurological explanations. The simplicity and untestability (How could it ever be shown that demons *do not* cause psychoses?) of such hypotheses gives them great obscurantist potential.

(ii) Among laws of nature, van der Waals's laws for gases are more complicated than the Boyle–Charles law for ideal gases. Again, in the Newtonian two-body system of the earth and the sun, Kepler's relatively simple laws of planetary motion are replaced by more complicated ones that take account of the sun's own acceleration. Third, Einstein's field equations are awesomely

> complicated, nonlinear partial differential equations, and as such are enormously more complicated than the ordinary second order differential equation in Newton's law of universal gravitation. Remarkably, Swinburne himself mentions this greater complexity of Einstein's gravitational field equations, but his comment on it does not cohere with his demand for *a priori* simplicity. He says ([1991], p. 79):

> Newton's laws [. . .] are (probably) explained by Einstein's field equations of General Relativity [as special approximations under specified restrictive conditions]. In passing from Newton's laws to Einstein's there is I believe a considerable loss of [*a priori*] simplicity [. . .] But there is some considerable gain in explanatory power.

Note, however, that the sacrifice of *a priori* simplicity for the sake of greater explanatory power is dictated by *empirical* constraints. Thus, Swinburne seems to admit, in effect, that empirical facts override his *a priori* simplicity *qua* the governing heuristic criterion of theory-formation. In sum, epistemologically, all of the more complicated laws I have mentioned were of course prompted by empirical findings.

(iii) Simplicity enters into curve fitting to a finite number of data points. But just how? Glymour ([1980], pp. 77–79), in effect, answers this question tellingly as follows:

> It is common practice in fitting curves to experimental data, in the absence of an established theory relating the quantities measured, to choose the 'simplest' curve that will fit the data. Thus linear relations are preferred to polynomial relations of higher degree, and exponential functions of measured quantities are preferred to exponential functions of algebraic combinations of measured quantities, and so on (p. 78).
>
> The trouble is that it is just very implausible that scientists typically have their prior degrees of belief distributed according to any plausible simplicity ordering, and still less plausible that they would be rational to do so. I can think of very few simple relations between experimentally determined quantities that have withstood continued investigation, and often simple relations are replaced by relations that are infinitely complex: consider the fate of Kepler's laws (p. 79).

I presume that Glymour's remark about Kepler's three laws does not pertain just to the complication arising from the two-body problem, which I already mentioned (under (ii)), but *a fortiori* to the *ten-body* problem of the Newtonian gravitational interaction of the sun with all of the nine planets. The solutions of these equations of motion are infinitely complex in the sense that they take the form of infinite series rather than featuring a much simpler closed, finite form. Besides, Richard Feynman has pointed out that this full planetary system is 'chaotic' in the technical sense of modern chaos theory: Very slight differences in the initial velocities or accelerations issue after a while in very large orbital differences.

It emerges that empirical facts as to how much or little 'simplicity' there is in the world undermine Leibniz's and Swinburne's notion that the conceptual deliverances of epistemically *a priori* simplicity—even if they were coherent—can at all be mandatory for what is ontologically the case.

In a perceptive critical review of Swinburne's *Is There a God* ([1996]), Quentin Smith ([1998]) examines his argument that theism is the simplest hypothesis, since God is infinite, while infinity and zero are the simplest notions employed by scientists. And Swinburne's reason for claiming that a state of nothing, *excluding* God, is the most natural state of the world is likewise that such a presumed state is conceptually the simplest.

Smith points out, however, that Swinburne equivocates on four different senses of 'infinity' which need to be distinguished. Briefly, Smith explains, these four senses are the following: (i) 'Infinite' refers to Georg Cantor's lowest transfinite cardinal number Aleph-zero; (ii) 'Infinite' refers to a speed, as in an instantaneous transmission of an effect, which is familiar from Newtonian gravitational interaction but is clearly different from the transfinite cardinal Aleph-zero; (iii) A third sense, different from the first two, pertains to the maximum degree of a graduated qualitative property. In this sense, God is infinite, because he is presumed to have the maximum degree of power, knowledge and goodness.

Parsons ([1989], Ch. 2) and Michael Martin ([1990], pp. 110–118) had offered other objections to Swinburne's notion of simplicity.

Recall Swinburne's contention that 'If there is to exist something, it seems impossible to *conceive* of anything simpler (and therefore *a priori* more probable) than the existence of God' ([1991], pp. 283–84; italics added). Recall also that this claim does not heed Quinn's aforestated *caveat* not to slide unsupportedly from being the simplest concept to being the simplest hypothesis. Then we can see that, for Swinburne, conceptual simplicity has *ontological* significance by being legislative for what does exist. Thus, for him, conceptual simplicity is not, at least in the first instance, a methodological, pragmatic, or inductive criterion.

Accordingly, Swinburne's writings do not, I believe, bear out the following suggestion as a counter to me: What he really had in mind was not a criterion of absolute simplicity based on concept-simplicity alone, but rather an injunction to 'always accept that theory which is the simplest one consistent with the data'. But this reading would turn Swinburne's thesis into a rather commonplace version of Occamite methodology. Thus construed, he would then be defending the hypothesis that God exists as the simplest explanation of the world's existence and content consistent with all known data. Admittedly—so the suggestion runs—this retort would not save Swinburne's espousal of SoN, but it might allow him to parry a number of my animadversions.

To this I say: I doubt that his philosophical framework could compatibly incorporate this suggestion. Besides, one basic part of that framework is the supposed divine volitional explanation of the existence of the world, and of its contents. But, as I shall argue in Section **3,** that explanation fails on several counts.[5]

Evidently, Swinburne presents us with a misdepiction of the use of simplicity criteria in actual science, although he claims continuity with actual scientific theory-construction for his conceptual standard of simplicity. Just as the lesson spelled out

by scientific theoretical progress undermined his *a priori* conceptual avowal of SoN as a basis for external divine creation, so also his pseudo-Occamite argument for normative *a priori* simplicity fails. Thus, Swinburne's attempt to underwrite SoN by recourse to simplicity is abortive. But, in the absence of SoN, the logical contingency of the existence of the world does not jeopardize its existence one iota! Accordingly, the claim that a divine external cause is needed to prevent the world from lapsing into nothingness is baseless.

2.3 The role of the normalcy of nothingness in the medieval Arabic Kalām Argument

To conclude my contention that the appeal to SoN wrought philosophical mischief in several of the major theistic cosmological arguments, let me consider the medieval Arabic *kalām* argument for a creator, as articulated and championed by William Craig ([1979]).

We shall see that, contrary to Craig's assertion, the so-called *kalām* version of the cosmological argument, which he defends, is likewise predicated, though only quite tacitly and insidiously, on the baseless SoN. The *kalām* argument was put forward by such medieval Arab philosophers as al-Kindi and others (see Craig [1979]).

In Craig's 1994 'A Response to Grünbaum on Creation and Big Bang Cosmology' (Craig [1994b], p. 247), he wrote:

> Grünbaum conflates three versions of the cosmological argument. The *Kalam* version, which I have defended, says nothing about a *causa/ratio essendi.* The Thomist version, as it comes to expression in Aquinas's *Tertia Via,* argues for a *causa essendi* on the basis of the real distinction between essence and existence in contingent things, *a distinction which disposes them to nothingness.* The Leibnizian version in no way pre-supposes a disposition toward nothingness in contingent things, but seeks a *ratio* for the existence of anything, even an eternal thing which has no disposition to nothingness, in a being which is metaphysically necessary [. . .] *Thus Grünbaum's demand for evidence of the spontaneity of nothingness is not in every case a relevant demand* [italics added].

But I claim that I am not guilty of any conflation of the three versions of the cosmological argument for the existence of God. In the case of Aquinas, Craig acknowledges my demand for evidence supporting SoN as 'a relevant demand'. But since he gives no hint as to how this demand could be met, I presume that he has no response to my argument against SoN. As for Leibniz, I have documented above that, contrary to Craig, Leibniz's cosmological version does presuppose SoN, so that Craig's denial that it does so is just incorrect. Yet I allow that Leibniz's sundry publications may not be coherent on this issue.

As for Craig's endorsement of the *kalām* version, I can now show that, *malgré lui,* it derives its spurious plausibility from a tacit, though subtle, appeal to SoN. In his attack on my views, which was replete with red herrings, Craig ([1992])

claimed that the old *kalām* Cosmological Argument justifies a creationist theological interpretation of the big bang world. Specifically, in my paraphrase, he offers the following *kalām* proposition to be metaphysically necessary ([1979], pp. 141–48, [1994a], [1994b]; Craig and Smith [1993], pp. 147, 156): 'Anything that begins to exist but does not have a transformative cause *must have* a creative cause *ex nihilo,* rather than no cause at all'.

Yet in the big bang universe, we have an unbounded interval of past time that is only metrically finite in years. This means that there is no first moment of time. Ordinally and topologically, the past-open time interval is isomorphic with a time that is metrically infinite in years. But Craig untutoredly declares an infinite past time to be logically impossible! And he speaks of the big bang universe as 'beginning to exist' by misdepicting the big bang singularity as a genuine first-moment of time (Grünbaum [1994], [1998], section 5A, pp. 25–26).

But why, I ask, does a big bang universe that 'begins to exist', in the special sense that there were no instants of time preceding all of the moments in the metrically finite unbounded past, require an external creative cause at all in the absence of a transformative cause? Is it not because Craig tacitly embraces SoN and uncritically assumes that the externally uncaused, natural state of the world is one of nothingness? What else makes it *psychologically compelling* to Craig and some others that an externally uncaused physical universe is 'metaphysically' impossible *tout court?* Would Craig's intuition of metaphysical necessity not dissipate, once its tacit reliance on the baseless SoN, and its misextrapolation from cases of warranted external causation are made explicit?

SoN as a source of Craig's avowed 'metaphysical intuition that something cannot come out of absolutely nothing'—which is akin to the scholastic dictum *'ex nihilo, nihil fit'*—seems also to be subtly present in his quasi-Leibnizian argument from the supposed potentiality of the universe to exist. That potentiality, Craig tells us, is causally but not temporally prior to the Big Bang. And he relies on it to buttress his stated metaphysical intuition as follows (Craig [1991]):

> A pure potentiality cannot actualize itself [. . .] On the theistic hypothesis, the potentiality of the universe's existence lay in the power of God to create it. On the atheistic hypothesis, there did not even exist the potentiality for the existence of the universe. But then it seems inconceivable that the universe should become actual if there did not exist any potentiality for its existence. It seems to me therefore that a little reflection leads us to the conclusion that the origin of the universe had a cause.

Here Craig is telling us that an external cause is required to effect the realization of 'the [mere] potentiality of the universe's existence', and that if the latter potentiality did not exist, 'then it seems inconceivable that the universe should *become* actual' (italics added). But what reason is there in the temporally unbounded big bang model for claiming that the big bang universe ever *'became* actual'? The most immediate reason seems to be the ill-founded SoN, and the question-begging supposition that 'the

potentiality of the universe's existence lay in the power of God to create it', a potentiality, which then required divine creation to be actualized.

Yet Craig insists that since the singularity of the big bang model avowedly had no earlier cause, it must have had a simultaneous one, because it is metaphysically impossible that it be uncaused or 'come out of absolutely nothing'. And he charges me with having overlooked this 'obvious alternative' of a simultaneous cause, claiming that the Big Bang singularity and its purported divine cause 'both occur coincidentally (in the literal sense of the word), that is, they both occur at t_0' (Craig [1994a], pp. 218, 222, fn. 1). But surely the *temporal* coincidence of events is not tantamount to *literal* coincidence. And, as is well known to physical cosmologists, if t_0 is used as a label for the singularity, it does *not* designate a bona fide instant of physical time (Grünbaum [1998], pp. 25–26). Instead, the term 'the big bang' is short, in this instance, for the behavior of the universe during its unbounded early temporal past.

Now I must ask anew: What, other than the insidious SoN, could make *psychologically compelling* Craig's avowed 'metaphysical intuition that something cannot [spontaneously] come out of absolutely nothing' (Craig [1991])? I answer: Once we abandon his misleading language of 'coming *out of* nothing', we can describe the situation as follows: The big bang models feature a world whose past time is unbounded (open) but metrically finite in years. Absent the tacit presupposition of the baseless SoN, there is just no cogent reason for requiring an external creative cause for the existence of that world! We must be ever mindful to extirpate the baseless SoN from our cognitive (unconscious) awareness.

John Earman ([1995], p. 208), when presumably speaking of the *kalām* argument, writes:

> A seemingly more sophisticated but not essentially different response is that something cannot begin to exist without a cause so if there is no physical cause of the beginning to exist, there must be a metaphysical one. Here I am in complete agreement with Professor Grünbaum in that the standard big bang models [. . .] imply that for every time t there is a prior t' and that the state at t' is a cause (in the sense of causal determinism) of the state at t (fn. 7 omitted here).

Samuel Clarke, Leibniz and, in their wake, other philosophers have asked for an explanation of the existence of this *set* of states *as whole,* and indeed of the conjunction of all facts (Gale [1991]), over and above the explanation of each individual state t by some prior state or other t'. But why is it thought that the entire series of states requires an *external* cause, instead of being a fundamental, logically contingent brute fact? If the Clarkians envision divine volition as providing the explanation they demand (Quinn [1993]), then I argue, as I am about to do, that such a theological explanation fails multiply. Besides, Quentin Smith, in a perceptive paper 'Internal and External Causal Explanations of the Universe' ([1995]), contended that contemporary discussions of the Clarke and Leibniz challenge 'are vitiated by an inadequate understanding of the relation between a cause external to a whole and the whole itself (in the broad sense of "whole" that includes sets, mereological sums,

aggregates and organic unities).' Smith argues that, regardless of what kind of whole the universe may be, it cannot be *externally* caused by the God of classical theism, who supposedly created it *ex nihilo.*

I conclude from the foregoing that Craig has failed to show cogently that the universe ever 'became actual' at the phantom time t_0, let alone that the atheist, anti-creationist position is damaged by not countenancing a corresponding potentiality.

3 Critique of the 'explanation' of the most fundamental laws of nature by divine creative volition

Philip Quinn wrote ([1993], pp. 607–08):

> The conservation law for matter-energy is logically contingent. So if it is true, the question of why it holds rather than not doing so arises. If it is a fundamental law and only scientific explanation is allowed, the fact that matter-energy is conserved is an inexplicable brute fact. For all we know, the conservation law for matter-energy may turn out to be a derived law and so deducible from some deeper principle of symmetry or invariance. But if this is the case, the same question can be asked about this deeper principle because it too will be logically contingent. If it is fundamental and only scientific explanation is allowed, then the fact that it holds is scientifically inexplicable. Either the regress of explanation terminates in a most fundamental law or it does not. If there is a deepest law, it will be logically contingent, and so the fact that it holds rather than not doing so will be a brute fact. If the regress does not terminate, then for every law in the infinite hierarchy there is a deeper law from which it can be deduced. In this case, however, the whole hierarchy will be logically contingent, and so the question of why it holds rather than some other hierarchy will arise. So if only scientific explanation is allowed, the fact that this particular infinite hierarchy of contingent laws holds will be a brute inexplicable fact. Therefore, on the assumption that scientific laws are logically contingent and are explained by being deduced from other laws, there are bound to be inexplicable brute facts if only scientific explanation is allowed.
>
> There are, then, genuine explanatory problems too big, so to speak, for science to solve. If the theistic doctrine of creation and conservation is true, these problems have solutions in terms of agent-causation. *The reason why there is a certain amount of matter-energy and not some other amount*[6] *or none at all is that God so wills it, and the explanation of why matter-energy is conserved is that God conserves it.* Obviously nothing I have said proves that the theistic solutions to these problems are correct. I have *not* shown that it is *not* an *inexplicable brute fact* that a certain amount of matter-energy exists and is conserved. For all I have said, the explanatory problems I have been discussing are insoluble. But an insoluble problem is not a pseudoproblem; it is a genuine problem that has no solution. So Grünbaum's claim that creation is a pseudoproblem for big bang cosmogonic models misses the mark (italics added).

In the same vein, Quinn ([1993], p. 606) cites Swinburne's book *The Existence of God* ([1979 edn], pp. 123–25). Speaking of the laws of nature **L,** Swinburne declared: **'L** would explain why whatever energy there is remains the same; but what **L** does not explain is why there is just this amount of energy.'

My response is twofold: (i) I contend that Quinn offers a *non-sequitur* in his conclusion 'So Grünbaum's claim that [the problem of] creation is a pseudoproblem for big bang cosmogonic models misses the mark', and (ii) The theistic volitional explanations for the existence and nomic structure of the world championed by Quinn and Swinburne are inherently defective.

(i) In Quinn's argument for his complaint that I had leveled an unsound charge of pseudo-problem, he conflates two different problems, only one of which I had indicted as a pseudo-issue. In a passage that he himself (Quinn [1993], p. 605) had adduced from Leibniz, that philosopher had lucidly stated the pertinent two distinct questions when he demanded 'a full reason why there should be a world at all, and why it should be such as it is'. Quinn reasoned fallaciously ([1993], p. 607) that if the latter question is a 'genuine explanatory problem' even when addressed to the most fundamental laws and facts of nature—as he claims—then so also the former question 'why is there is a world at all?' must be genuine. But in my complaint of pseudo-problem, I had targeted only the question: 'What is the *external cause* of the very existence of the universe?' It is *this* problem that is at issue when Quinn speaks of my dismissal of 'the problem of creation'.

I had rejected it as misbegotten, because it is avowedly or tacitly predicated on the SoN doctrine, a tenet that I have been at pains to discredit as ill-based. And I favor the use of the pejorative term 'pseudo-problem' to derogate a question that rests on an ill-founded or demonstrably false presupposition; yet in so doing, I definitely do not intend to hark back to early positivist indictments of 'meaninglessness'.

Assuming that the most fundamental laws and facts of the world are logically contingent, one can clearly allow the question why they are what they are, as contrasted with logically possible alternatives to them, even as one rejects the different existential question 'Why is there anything at all, rather than just nothing?' Thus, when I indicted the latter as a pseudo-problem, I did not thereby disallow the former. Yet Quinn reasons illicitly that since the former question is genuine, my rejection of the latter 'misses the mark'.

In the opening paragraph of his lengthy critique of my rejection of theological interpretations of physical cosmology, Quinn ([1993], p. 589) had declared that the aim of his critique is to refute my charge of pseudo-problem. I claim that he failed, when he conflated Leibniz's two questions.

(ii) This brings me to the theological answer given by Swinburne and Quinn to their question why the nomological structure and content of the world are what they are.

To set the stage for my array of animadversions against their divine volitional answer, let me mention Richard Gale's view ([1999]) that '[. . .] ultimate disagreements between philosophers are due to their rival sentiments of *rationality* as to what constitutes a rationally satisfying explanation of reality.' Two such rival views of rationality, Gale points out, are the scientific world view, on the one hand, and the man-centered one, which employs anthropomorphisms, on the other. Theistic advocates of 'natural religion' champion the anthropomorphic perspective of personhood in their proffered explanations of everything *via* divine creative volition, a standpoint rejected by Santayana, Bertrand Russell, and a host of others.

Let me defer, for now, adjudicating the merits of these two competing world views, and first set forth some fundamental epistemological and methodological differences between them. These deep differences exist, despite Swinburne's claim of solid methodological continuity between the two world views and their respective criteria of rationality. Says he ([1996], p. 2): 'The very same criteria which scientists use to reach their own theories lead us to move beyond those theories to a creator God who sustains everything in existence.' Moreover, he asserts theistic *pan*-explainability, declaring (ibid.): '[. . .] using those same [scientific] criteria, we find that the view that there is a God explains *everything* we observe, not just some narrow range of data. It explains the fact that there is a universe at all [*via* SoN], that scientific laws operate within it' (*cf.* also his [1991], Ch. 4 on 'Complete Explanation').

Note, however, that Swinburne and others who offer divine volitional explanations would offer precisely such an explanation, if the facts of our world were radically different, or even if, in a putative world-ensemble of universes, each of them had its own laws, vastly different from the respective laws in the others. Their schema of theistic volitional explanations relies on roughly a model of intentional action affine to Aristotle's practical syllogism (hereafter 'PS') for intentional action.

As we just saw, Swinburne maintains that the hypothesis of divine creation 'moves beyond' scientific explanations *via* the very same epistemological criteria. As against that contention, let me now set forth the substantial explanatory discrepancies between them.

Neither Swinburne nor Quinn spelled out the provision of a deductive theistic volitional explanation, which they claim for the hypothesis of divine creation. I now offer a reconstruction of essentially the deductive explanatory reasoning that, I believe, they had in mind. And I am glad to report that Quinn (private communication) authenticated my reconstruction, at least in regard to himself. It reads:

Premise 1.
God freely willed that the state of affairs described in the *explanandum* ought to materialize.

Premise 2.
Being omnipotent, he was able to cause the existence of the facts in the *explanandum* without the mediation of other causal processes.

Conclusion:
Our world exists, and its contents exhibit its most fundamental laws.

It is to be understood that this reconstruction is only schematic, since the actual specifics of the most basic laws are not stated in the Conclusion.

But two basic considerations jeopardize the epistemic viability of this proffered volitional theological explanation:

(i) Epistemically, it will succeed *only if* the theist can produce cogent evidence, *independent of the explanandum,* for the very content of the volition that the proffered explanation imputes to the Deity; failing that, the deductive argument here is not viable epistemically; but where has the theist produced such independent evidence? Moreover, Premise 2 unwarrantedly assumes the availability of a successful cosmological argument for the existence of the God of theism.
(ii) Relatedly, the explanation is conspicuously *ex post facto,* because the content of the volition imputed to God is determined retrospectively, depending entirely on what the specifics of the most fundamental laws have turned out to be.

William James has beautifully encapsulated the *ex post facto* character of the relevant sort of theological explanation, in which God is Hegel's Absolute. Speaking of the facts of the world, James ([1975], p. 40) declared:

> Be they what they may, the Absolute will father them. Like the sick lion in Esop's fable, all footprints lead into his den, but *nulla vestigia retrosum* [i.e. no trace leads back out of the den]. You cannot redescend into the world of particulars by the Absolute's aid, or deduce any necessary consequences of detail important for your life from your idea of his nature.

But no such *ex post facto* deficiency is found in typical explanations in physics or biology such as (i) the Newtonian gravitational explanation of the orbit of the moon; (ii) the deductive-nomological explanations of optical phenomena furnished by Maxwell's equations, which govern the electromagnetic field, or in a statistical context; (iii) the genetic explanations of hereditary phenotypic human family resemblances.

But according to familiar scientific evidential criteria which Swinburne tirelessly professes to employ—as in his appeal to Bayes's theorem—his and Quinn's deductive argument appear to be *epistemologically frivolous* by being altogether *ex post facto.* None the less, Swinburne ([1991], p. 109), speaking of the explanandum *e,* is explicitly satisfied with such an *ex post facto* mode of explanation: '[. . .] clearly whatever *e* is, God being omnipotent, has the power to bring about *e.* He will do so, if he chooses to do so.' Yet since we obviously have no independent evidential access to God's choices, Swinburne has to *infer* completely *ex post facto* whether God's choices included *e* from whether or not *e* is actually the case.

In ordinary action-explanations on the model of Aristotle's PS, we often, if not typically, do have independent evidence—or at least access to independent evidence—as to the content of the agent's motives. That is to say, we have evidence for the imputed motives *other than* the action taken by the agent. And, absent such evidence, we reject the proffered action-explanation as viciously circular. Thus if I explain an unreasonable reprimand of an academic colleague by the department chairman as vindictive, I may do so on the basis of independent evidence that the chairman harbors aggressive feelings toward the colleague, because of the colleague's repeated expressions of disrespect for the chairman. By the same token, we reject imputations of motives for given actions as facile, when there is no independent evidence for the agent's possession of the attributed motives.

In this sense, I claim that the attribution of the existence of the world to God's willing that it exist is unacceptably *ex post facto.* Let me emphasize that, as I lodge it, the complaint that *ex post facto* explanations afford no independent empirical check on their premises is *not* focused on their being non-predictive. Non-predictiveness is not tantamount to untestability, since a theory may be retrodictive without being predictive. For example, (neo)-Darwinian evolutionary theory is essentially unpredictive in regard to the long-term evolution of species, but it retrodicts numerous previously unknown past facts in the fossil record. Similarly, being an untreated syphilitic is not predictive of affliction with neurologically degenerative paresis. Yet, since only untreated syphilitics become paretics, being paretic testably *retrodicts* having been an untreated syphilitic. But an explanation that is neither retrodictive nor predictive and whose premises have no corroboration by evidence independent of the given *explanandum,* is paradigmatically *ex post facto.*

There are further difficulties in the theistic explanation above: God's omnipotence will now serve to show that Swinburne's and Quinn's deductive volitional explanation does not meet Leibniz's aforecited demand for a 'full reason why', if there is a world at all, 'it should be such as it is'. Having harped on God's omnipotence earlier, Swinburne develops it further ([1991], p. 295):

> God, being omnipotent, cannot rely on causal processes outside his control to bring about effects, so his range of easy control must coincide with his range of direct control and *include all states of affairs which it is logically possible for him to bring about* (italics added).

Precisely because God is omnipotent, however, he could clearly have chosen any one of the logically possible sets of fundamental laws to achieve his presumed aims—goals that are outlined by Swinburne—rather than the actual laws. Yet, if so, then exactly that latitude shows that, if the stated epistemic defects are to be avoided, the theological explanatory scenario fails to satisfy Leibniz's demand. Swinburne himself concedes that the theistic explanation is wanting: 'It is compatible with too much. There are too many different possible worlds which a God might bring about' ([1991], p. 289). Thus, God's supposed choice to create the actual world is presumably a matter of brute fact.

How, then, does Swinburne justify that his theological explanation above improves upon a scientific system in which explanation is envisioned as departing from the most fundamental laws of nature, which are themselves taken to hold as a matter of brute fact? In the face of the epistemic flaws I have set forth, Swinburne's and Quinn's theological superstructure appears to be an explanatorily misguided step.

Furthermore, the details of the proposed theological explanation, employing the aforementioned modified version of the PS, is beset by difficulties of its own. Swinburne ([1991], p. 296) opines that '[. . .] although certain physical conditions of the brain need to occur if human agents are to have intentions which are efficacious, the human model suggests a simpler model in which such limitations are removed.' Leaving aside his hapless *a priori* simplicity, let me recall that he and Quinn rely on direct, unmediated divine volitional creation of the world *ex nihilo* (Swinburne [1991], p. 294; Quinn [1993], p. 602). Yet Quinn cautions us ([1993], p. 597): 'I leave open the question of whether God and his volitions are timelessly eternal by not building into this locution [of direct bringing about] a variable ranging over times of occurrence of divine willings.' On the other hand, Swinburne ([1991], p. 8) dissociates himself from the notion of divine timeless eternity, and says: 'I understand by God's being eternal that he always has existed and always will exist.'

Like many others, I find it unintelligible to be told by Quinn that any mental state, especially a volitional one that creates *ex nihilo,* can be 'timelessly eternal'. *A fortiori* it defies comprehension how such a timeless state can 'bring about' a state of existence at any one ordinary *worldly* time. The reply that this complex event happens in *metaphysical* time merely mystifies further an already conceptually elusive situation.

Thus, the best I can do to make the supposed creative process intelligible is to construe their direct divine causation as taking the following form: God is in the injunctive mental state 'let there be the existing world', including the Biblical 'let there be light'. And this mental state instantaneously causes the world to exist.

But in all of our ordinary and scientific reasoning, it would be regarded as magical thinking to suppose that any *mere thought* could bring about the actual existence of the thought-object, let alone out of nothing. Hence I can only welcome the assertion of the Jesuit theologian Michael Buckley ([1990], p. 314) that, as for divine volitional creation, 'We really do not know how God "pulls it off"' ([1990], p. 314). But then Buckley continues in an apologetic mode: 'Catholicism has found no great scandal in this admitted ignorance.' While I accept this account of the attitude of the exponents of Catholic doctrine, I regard the admitted explanatory gaping lacuna as a 'scandal' of unintelligibility.

As a further cardinal methodological difference between scientific and creationist reasoning, I now consider Quinn's attempt to reconcile the following two claims: (i) the theistic doctrine that divine perpetual creation (or re-creation) is causally necessary to prevent the universe from lapsing into nothing at any one moment, on the one hand, and (ii) the assertion of the scientific mass-energy-conservation law, on the other. I had argued for their logical incompatibility ([1996], [1998]).

Yet in discussing this issue of logical compatibility, we must be mindful of the fact that the technical scientific concept of energy is highly *theory-relative* by depending on

the energy-ontology of the particular pertinent scientific theory. And, furthermore, we must heed the caveat emphasized by John Leslie ([1996], p. 131) that the application of the energy concept to the entire universe is quite problematic in contemporary physical theory, notably in big bang and quantum cosmology, a caveat not honored by either Swinburne or Quinn.

How, then, does Quinn reason specifically that he can reconcile the supposed causal necessity of divine underwriting of the physical conservation law with its formulation in physics or chemistry textbooks, and in scientific encyclopedias? One such encyclopedia reads (Newman [1965]): 'The mass-energy content of an isolated system remains constant. The energy can be converted from one form to another, but can neither be created nor destroyed.' Note importantly that this statement asserts the impossibility of either the creation or annihilation of energy *tout court* as a law of nature. Furthermore, since the law declares the impossibility of the annihilation of energy, the energy *could not lapse into nothingness* anyway in the absence of God's supposed ontological support. Therefore, contrary to the long theistic tradition of perpetual creation espoused by Quinn, God is clearly *not* needed to *prevent* such supposed spontaneous annihilation by creative intervention. *This is a conclusion of cardinal importance* (Grünbaum [1996], p. 539, [1998], p. 29).

Quinn had laid the groundwork for his response, when he maintained that God is the only and the total cause of energy-conservation. Then he replied to my charge of incompatibility as follows ([1993], p. 603):

> Grünbaum has argued that what I have said so far does not get to the heart of the matter. His key thesis, he says, is that the mere physical closure of a system is causally sufficient for the conservation of its matter-energy because the conservation of matter-energy is a matter of natural law. However, this thesis rests on an understanding of the conservation law that theists of the sort I have been discussing would reject. They would insist that the sum total of matter-energy in a physically closed system remains constant from moment to moment only if God acts to conserve it from moment to moment. Because they hold that divine conserving activity is causally necessary for the conservation of matter-energy even in physically closed systems, such theists would deny that the mere physical closure of a system is causally sufficient for the conservation of its matter-energy. So they would take the true conservation law to contain an implicit ceteris paribus clause about God's will. When spelled out in full detail, the law is to be understood as implying that if a system is physically closed, then the sum total of matter-energy in it remains constant if and only if God wills to conserve that sum total of matter-energy.
>
> It is important to realize that it does not lie within the competence of empirical science to determine whether Grünbaum's understanding of the conservation law is rationally preferable to the theistic understanding I have sketched. The empirical methods of science could not succeed in showing that divine activity does not conserve the matter-energy in physically closed systems.

I have several critical comments on this passage (*cf.* also Grünbaum [1996], [1998]). And I use the term 'energy-conservation' as short for mass-energy conservation.

(i) Recall that the doctrine that perpetual divine creation is causally necessary for physical energy-conservation is tacitly predicated on SoN, which I have shown to be baseless.

(ii) Quinn, though not Swinburne, told us that physical energy conservation is only an epiphenomenon, presumably in the sense of Malebranche's occasionalism.[7] And he rests that thesis on the purported causal exclusivity and totality of God's conservationist role. Thus, he lays down the proviso that the physical conservation law holds 'if and only if God wills to conserve that sum total of matter-energy'. This contention, however, makes that physical law totally irrelevant, both causally and *explanatorily,* to physical energy conservation.

(iii) Oddly, Quinn peremptorily shifts the probative burden of evidence from his own shoulders to mine. In lieu of himself giving *positive* evidence for his theistic proviso, which he ought to have done—over and above telling us that his theistic *confrères* avow it—he illegitimately calls on me to *refute* it. But surely it is not incumbent on me to disprove such a wholly untestable proviso, any more than Quinn is required to confute a *rival* proviso asserting that only Satan's intervention preserves the total energy with the help of poltergeists who refrain from making noises!

(iv) Having thus improperly shifted the burden of proof from himself to me, Quinn concludes that 'it does not lie within the competence of empirical science to determine whether Grünbaum's understanding of the conservation law is rationally preferable to the theistic understanding [. . .].' But since Quinn did not justify his proviso by evidence, on what grounds, I ask, does *he* feel rationally entitled to espouse it?

(v) Last, but by no means least, I argue that Quinn's imposition of his proviso, *in epistemic effect,* turns the physical conservation law into an empty tautology. The proviso amounts to the claim of *creatio continuans* that the physical conservation law is true only if God does not make it false by 'suspending' it. And this claim, in turn, is tantamount to the following conjunction: (a) The *tautology* that the law is true only if it is not false, and (b) The law will cease to hold if God 'suspends' it at some time.

Yet plainly, we have no independent evidential access to whether and when God decides to discontinue his supposed ontological support for the physical law, so that God's 'suspension' in (b) is epistemically otiose. Evidentially, God's 'suspension' amounts to the empirical falsity of the law. Thus, *epistemologically,* Quinn's avowal reduces to the *tautological* averral that the conservation law holds except when it doesn't, which is the empirically empty logical truth that the law is either true or false!

What physicist, I ask, would *nowadays* countenance such an epistemic trivialization of the law, be he/she religious or not? And, since the physical law asserts *tout court* that energy can neither be created nor destroyed, why should everyone else *not* regard

Quinn's imposition of the theistic proviso on the physical law as a mere *ad hoc* rescuing maneuver needed to meet my charge of incompatibility?

> (vi) Let us recall the challenge I issued to the intelligibility of the process of instantaneous divine creation; and also the cognate admission by the Jesuit Michael Buckley that 'We really do not know how God "pulls it off"'. Then one further moral of the epistemic demise of Quinn's proviso is that, contrary to his and Swinburne's contention, their version of divine volitional explanation provides no epistemically viable account of why the physical energy conservation law holds, let alone of why the magnitude of the total energy is what it is, presumably to within a choice of units and of a zero of energy.

As for the putative divine 'suspension' of one or more of the laws of nature, Swinburne ([1989], Ch. 8) has offered criteria (p. 79) for a divine miracle *qua bona fide* 'Violation of a Law of Nature'. But elsewhere (Grünbaum [forthcoming]), I shall give major counter-examples to his criteria for a violation of one or more true laws of nature, as distinct from what are believed to be the laws at any given stage of scientific theory.

In regard to Swinburne's argument from religious experience ([1991], Ch. 13) of a transcendent God endowed with the triad of 'omnis', I confine myself to just deeming it impossible that the human cognitive apparatus could ever experience such a God. How, for example, can a human being possibly receive cognizance of an omnipotent transcendent being *via* perceptual or non-perceptual direct religious experience? Surely this is a matter of dare-devil *inference* rather than of direct human experience. Hence I consider the reports of such alleged transcendent experiences to be fundamental epistemic misinterpretations of them, whatever else they might deliver.[8]

I have provided an only occasionally evaluative account of some of the fundamental differences between the scientific and the anthropomorphic world views sketched above by Richard Gale. Note that theism relies on the anthropomorphism of attributing personhood to God, and it is *anthropocentric* as well, by holding that God chose a world in which human beings would play an important role. Let me now provide my promised appraisal of the rivalry between these competing world views.

Gale has expressed the following view concerning that rivalry:

> That a belief results from wish fulfillment and lacks evidential support is not alone a reason for charging it with being irrational. For our belief that our senses and memories are in general reliable results from wish fulfillment and has no non-circular evidential support, but is not irrational for that reason (private communication).

To this, I respond in several ways:

1. It is both unreasonable and utopian to demand of an epistemic system that it provide an *internal* justification of its fundamental epistemic points of departure, if such there be. As Gale surely knows, such foundationalism has been ably

challenged. In any case, just as every non-*a priori* explanatory system has to start from some unexplained explainers, so also any epistemic system must, in effect, contain some internally unjustified precepts as to what is to count as evidence. No epistemic system can completely pick itself up by its own bootstraps.

2 I see no grounds for Gale's claim that our epistemic dependence on sensory experience and memories is, in the first instance, wish-driven. Instead, such epistemic dependence is precisely the mechanism of our very existence and biological survival. And within our ordinary and scientific epistemic systems, both our sensory perceptions and memories are relentlessly *self-correcting*. By the same token, they tell us that wishful thinking more often than not leads to painful frustration and disappointment or even disaster, especially in some psychoses. Thus Freud observed: 'Experience teaches us that the world is not a nursery' (*Standard Edition,* vol. 22, p. 168). For just such reasons, Donald Davidson ([1982], p. 298) characterized wishful thinking as 'a model for the simplest kind of irrationality'.

3 The issue of rationality posed by Quinn apropos his theistic proviso, and surely also by Swinburne's invocation of scientific evidence in his reliance on Bayes's theorem, is set within a framework that completely bypasses Gale's demand for an epistemic system's self-justification: The appeal to self-correcting sensory experience, including memory, is *common ground* between these theists and myself in our debate on rational preferability. Therefore, I believe that this commonality and my other foregoing responses to Gale as well as to Quinn spell the following moral: I am fully entitled to conclude, contra Quinn, that my standard scientific construal of the conservation law, without his epistemic trivialization of it by his theistic proviso, is rationally preferable to Quinn's.

Finally, the theistic explanatory scenario for our world is abortive, because it is ethically incoherent: As Hume has emphasized, no omni-benevolent and omnipotent God would ever create a world with so overwhelmingly much gratuitous and uncompensated natural evil such as cancer, evil that is not due to human decisions and actions. In particular, evil comprises both moral and natural evil. Thus, even if God could be exonerated from moral evil *via* the so-called 'Free Will Defense', the strong challenge to God's omni-benevolence from natural evil remains. This egregious difficulty is attested by wide agreement, even among theists, that no extant theodicy has succeeded in neutralizing it.

True enough, Swinburne ([1991], Ch. 11 and p. 284, [1996], Ch. 6, [1998]) offered his own theodicy. But Quentin Smith ([1991], pp. 165–68, [1992], [1997], pp. 137–57) has discredited his earlier efforts, while Gale ([forthcoming]) undermined Swinburne's ([1998]). For my part, I claim that Swinburne sees the world through rose-colored glasses, preparatory to enlisting this glowing view of the world in the service of his theistic agenda. Thus, he opined ([1991], p. 284):

> The world contains much evil, but the evil is not endless and it is either evil brought about by men, or evil of a kind which is necessary if men are to have knowledge

> of the evil consequences of possible actions (without that knowledge being given in ways which will curtail their freedom), and which provides the other benefits described in chap. 11.

But this apologetic scenario does not meet the more inclusive challenge that David Hume issued through the interlocutor Philo in his *Dialogues Concerning Natural Religion.* As we shall see in Section **5,** Swinburne uses Bayes's Theorem from the probability calculus to claim that the existence of God is more probable than not. Yet Swinburne makes no mention of Salmon's telling 1978 paper 'Religion and Science: A New Look at Hume's *Dialogues*'. In that article, Salmon endorsed Philo's stance as part of casting Hume's [Philo's] case into Bayesian form. A year later, Salmon ([1979]) further articulated his pro-Humean stance.

4 The 'Anthropic Principle'

4.1 The scientific status of the Anthropic Principle

The so-called 'Weak Anthropic Principle' (WAP) has been construed in a number of naturalistic, non-theological ways, whose nub is the following: *Given* the currently postulated laws of nature, very sensitive physical conditions, going back to the earliest stages of a big bang universe, are *causally necessary* for the cosmic evolution and existence of carbon-based humanoid life. And these very delicate initial or boundary conditions are *a priori* exceedingly improbable, where the *a priori* probabilities are presumably defined on the set of all logically possible values of the pertinent physical conditions, which include the physical constants in the above laws of nature. Various authors speak of these sensitive initial conditions as being 'fine tuned' for life. But John Leslie, an exponent of the Design-interpretation of the 'fine tuning', issued the disclaimer '[. . .] talk of "fine tuning" does not presuppose that a divine Fine Tuner, or Neoplatonism's more abstract God, must be responsible' ([1990], p. 3). And the Roman Catholic theist Ernan McMullin rightly cautions ([1993], p. 602): '*Fine tuning* has something of the ambiguity of the term *creation*; if it be understood as an action, then the existence of a "fine tuner" seems to follow. Perhaps a more neutral term would be better.' Indeed, for just that reason, I suggest the use of the term 'bio-critical values' in lieu of the locution 'fine tunings'.

In an admirably thorough and cogent article, John Earman ([1987]) gave an account and appraisal of WAP, but without scrutiny (p. 314) of a theistic design construal of it and he concludes in part (pp. 314–5):

> The litany of the many ways the universe is fine tuned for life falls into two parts. First, for example, a tiny change in the strong nuclear force would mean the absence of complex chemical elements needed for life [. . .] Second, for example, a change in the energy density at Planck time by an amount as small as 1 in 10^{-5} as compared with the critical density (corresponding to a flat universe) would mean either that

> the universe would have been closed and would have recollapsed millions of years ago or else that it would have been open with a presently negligible energy density. The second category does not call for an attitude of agog wonder-at-it-all. Rather, it points to a potential defect, in the form of a lack of robustness of explanation, of the standard hot big bang scenario, a defect which the new inflationary scenario promises to overcome by showing how exponential expansion in the early universe can turn fairly arbitrary initial conditions into the presently observed state [. . .] Nor is it evident that puzzlement is the appropriate reaction to the first category. A mild form of satire may be the appropriate antidote. Imagine, if you will, the wonderment of a species of mud worms who discover that if the constant of thermometric conductivity of mud were different by a small percentage they would not be able to survive.
>
> Even if puzzlement as to the fine tuning of constants is appropriate, it does not follow that we must look for enlightenment either to Design or to worlds-within-worlds. . . .
>
> CONCLUSION
>
> Insofar as the various anthropic principles are directed at the evidentiary evaluation of cosmological theories they are usually interpretable in terms of wholly sensible ideas, but the ideas embody nothing new, being corollaries of any adequate account of confirmation. And insofar as anthropic principles are directed at promoting Man or Consciousness to a starring role in the functioning of the universe, they fail; for either the promotion turns out to be an empty tease or else it rests on woolly and ill-founded speculations.

To give pause to a teleological construal of WAP, it is well to remember that the universe is not particularly hospitable to humans. To emphasize this restricted hospitality, T. Schick ([1998], p. 98) quotes the renowned attorney Clarence Darrow as follows:

> Admitting that the earth is a fit place for life, and certainly every place in the universe where life exists is fitted for life, then what sort of life was this planet designed to support? There are some millions of different species of animals on this earth, and one-half of these are insects. In numbers, and perhaps in other ways, man is in a great minority. If the land of the earth was made for life, it seems as if it was intended for insect life, which can exist anywhere. If no other available place can be found they can live by the million on man, and inside of him. They generally succeed in destroying his life, and if they have a chance, wind up by eating his body.

In a very fine 1997 paper on 'The Lessons of the Anthropic Principle', John Worrall wrote:

> It is notoriously easy to play the coincidence game. Coincidences—'massively improbable' events can be created at will—especially if you are happy not to

think too sharply about what you treat as the random variables underlying the probabilities (p. 11).

Even in cases where probability talk is justified, it's just plain silly to say that some event has such a low probability of happening that it 'cannot have happened by chance'—chance is what governs both high and low probability events: low probability events tend to occur less often.

But if the best of all possible worlds would be one in which this perceived intolerable coincidence had been explained scientifically—that is, shown to be the deductive consequence of a further deeper theory that had independently testable empirical consequences that turned out to be correct, then surely the worst of all possible worlds is the one in which, by insisting that some feature of the universe cannot just be accepted as 'brute fact', we cover up our inability to achieve any deeper, testable description in some sort of pseudo-explanation—appealing without any independent warrant to alleged a priori considerations or to designers, creators and the rest (p. 13).

4.2 Critique of the theistic design interpretation of the Weak Anthropic Principle

In his *Dialogues on Natural Religion,* David Hume famously warned against sliding from an ordered universe to one featuring theistic Design. In this subsection, I shall examine critically the theistic Design interpretation of WAP, with which Earman did not deal and which Worrall dismissed.

Recall (from Section **3**) that divine omnipotence has the defect of failing to explain the explanandum by allowing too much. So also, I shall now argue, Swinburne and Leslie undermine their teleological construal of WAP by invoking the omnipotent God's Design to explain the *a priori* very improbable bio-critical values ('fine tuning'). It is crucial to note that, as a point of departure of their theistic argument, both Swinburne and McMullin take the laws of nature as given and fixed, no less than philosophical naturalists do. Thus, Swinburne wrote ([1991], p. 306): '[. . .] given the actual laws of nature or laws at all similar thereto, boundary conditions will have to lie within a narrow range of the present conditions if intelligent life is to evolve.' Elsewhere, Swinburne ([1990], p. 160) had made the same claim. Moreover, he averred ([1991], p. 312): '[. . .] the peculiar values of the constants of laws and variables of initial conditions are substantial evidence for the existence of God, *which alone can give a plausible explanation of why they are as they are*' (italics added). And divine action supposedly does so by teleologically transforming the *a priori* very low probability of the bio-critical conditions into probable ones.

Clearly, Swinburne operates with the assumption that the laws of nature are *given* as fixed. And he does so twice: (i) in his initial inductive inference of divine teleology from the bio-critical values, whose critical role is predicated on a given set of laws, and (ii) in the theistic teleological explanation of why these values 'are as they are'. And my challenge will be that this explanation does not cohere with divine omnipotence, which

negates the fixity of the laws. Relatedly, though far more cautiously than Swinburne, McMullin wrote ([1993], p. 603):

> According to the Biblical Account of creation, God chose a world in which human beings would play an important role, and would thus have been committed to whatever else was necessary in order for this sort of universe to come about. If fine tuning was needed this would present no problem to the Creator.

Although McMullin is careful to speak of fine tuning conditionally, bear in mind that the pertinent fine tuning would be needed *only* in the context of the *givenness* of the actual laws of nature.

The logical structure of Swinburne's explanation of the existence of the bio-critical values can be schematized essentially as follows: the premises are (i) the laws of nature are given, (ii) God wants to create human life, and (iii) under the constraints of the given laws, 'fine tuning' is necessary for the existence of human life. And the conclusion is that God selected the bio-critical values in his creation, and therefore they materialized.

But this explanation founders on the shoals of divine omnipotence, just as did the theistic volitional explanation of the ultimate laws of nature (*cf.* Section **3**). As noted earlier, Swinburne's account of omnipotence included the following creative nomological latitude ([1991], p. 295): 'God, being omnipotent [. . .] his range of easy control must [. . .] include all states of affairs [including laws] which it is *logically possible* for him to bring about' (italics added). Yet this conclusion undermines the theistic teleological explanation of the bio-critical values, a philosophical account that was predicated on the *contrary* assumption that God confronts fixed, rather than disposable laws of nature. Instead, God can achieve any desired outcome by any laws of his choosing. This result demonstrates the logical incoherence of the theistic anthropic account. Moreover, divine omnipotence makes the causal necessity of the bio-critical values *irrelevant* to the divine teleological scenario: In the context of suitably different natural laws, relating their corresponding variables to the existence of humanoid life, the *a priori* very low probability of the standard bio-critical values is no longer an issue at all, since the critical role of these values is relative to a specified fixed set of laws and is not played by them *per se*.

Again, as in the case of the theistic explanation of the laws of nature by divine volition (Section **3**), the doctrine of divine omnipotence has boomeranged!

In the teleological scenario, God is held to be omni-benevolent. But, given his omnipotence, his choice to let human and animal life evolve *via* Darwinian evolution clashes head-on with his omni-benevolence. How could the God of these two omnis possibly choose the mindless, unbelievably cruel and wasteful Darwinian process—Tennyson's 'nature red in tooth and claw'—as his way of bringing intelligent life onto the earth? After all, an untold number of far more benevolent mechanisms were available to him, even including the Biblical Garden of Eden arrangement of Adam and Eve. Besides, as Leslie ([1996], p. 81) has reported, 'There have been certainly five and maybe well over a dozen mass extinctions in Earth's biological history.' The Darwinian mechanism befits a cruel monster.

In an argument quite different from mine, Quentin Smith has contended ([1994], p. 372) that (i) there is a huge range of values of the constants of nature and initial conditions which do *not* issue in intelligent life but which are also *a priori* overwhelmingly improbable, and (ii) Swinburne's claim ([1990], p. 154) that the bio-critical values specially cry out for explanation is unjustified.

It turns out that the so-called 'anthropic' coincidences, which are purely physical, are *coextensive* with those that are critical for the formation and primordial existence of stars and galaxies. As Earman remarked ([1987], p. 309), 'the selection function [of initial/boundary conditions]' is served just as well by the existence of stars and planetary systems supporting a carbon-based chemistry but no life forms.'[9] Thus, since the 'fine tunings' are not distinctively anthropic after all, we must beware that the so-called 'Weak Anthropic Principle' (WAP) not be allowed to give the misleading impression that the 'fine tunings' are *anthropically* unique, *qua* being necessary for *our* existence. In this sense, the label 'Anthropic Principle' is pseudonymous. (I refer the reader to a *superb* critique of teleological interpretations of WAP, just published by the Nobelist physicist S. Weinberg ([1999]).)

5 Critique of Swinburne's Bayesian argument for the existence of God

5.1 The incoherence of Swinburne's apologia

Quinn ([1993], p. 622) has given a concise summary of Swinburne's Bayesian argument for the existence of God:

> He [Swinburne] argues that the hypothesis of theism is more probable given the existence over time of a complex physical universe than it is on tautological evidence alone, and he further contends that this argument is part of a cumulative case for theism whose ultimate conclusion is that 'on our total evidence theism is more probable than not' ([1979], p. 291).

But Swinburne hedged his Bayesian plaidoyer, declaring ([1991], Ch. 13, p. 244): 'Certainly one would not expect too evident and public a manifestation [of the existence of God] [. . .] If God's existence, justice and intentions became items of evident common knowledge, then man's freedom to choose [belief or disbelief] would in effect be vastly curtailed.' In short, in Swinburne's view, the requirements of human freedom of choice allegedly require God to play a kind of hide-and-seek game with us.

Richard Gale ([1994], p. 39) clarified this feature of Swinburne's view as follows:

> While Swinburne's overall aim is to establish that the [Bayesian] probability that God exists is greater than one-half, he does not want the probability to be too high, for he fears that this would necessitate belief in God on the part of whoever accepts the argument, thereby negating the accepter's freedom to choose not to believe.

Yet, assuming this clarification of Swinburne's argument here, the argument is flatly incoherent: He appeals to the need for free choice of belief to justify God's *not* giving us evidence for a high probability of his existence, on the grounds that a high probability would *cause* us to believe in God willy-nilly! But why, oh why, would a high probability *necessitate* our belief at all, *if* we have free choice to believe or not in the first place when we are confronted with evidence, however strong? In the process of saving our freedom to believe, Swinburne inconsistently assumes the causal determination of our beliefs (*cf.* Grünbaum [1972], Section IIB and C on the role of causality in belief-formation). His argument fares no better, if the pertinent freedom to choose is instead between good and evil. To suppose that this freedom would be vastly curtailed if God's existence, justice and intentions became items of evident common knowledge, postulates the *causal dependence* of our moral conduct on our putative theological knowledge. But how can that cohere with Swinburne's libertarian view of human action?

Gale (*op. cit.,* p. 40) cites Swinburne as having asserted that 'S believes that *p* if and only if he believes that *p* is more probable than any alternative', where the alternative is usually not-*p.* But Gale rightly disputes that claim: He gives examples from Tertullian to Kierkegaard, and from his own life, to the following effect (ibid.): 'It certainly is possible for someone to believe a proposition while believing that it is improbable, even highly improbable.'

In sum, Swinburne's apologia for God's evidential coyness is deeply incoherent. A cognate appeal to God's elusiveness has been made by the old apologetic doctrine of *deus absconditus,* such as Martin Buber's thesis of 'the eclipse of God' (Grünbaum [1995], pp. 211–2; *cf.* also J. L. Schellenberg [1993]). The characterization of God as self-concealing is found repeatedly in the Old Testament, and was also espoused by Martin Luther, for instance.

5.2 Swinburne's Bayesian argument for the existence of God

Swinburne takes it for granted that Bayes's theorem, which is derived from the formal (Kolmogorovian) probability axioms, is applicable to the probability of *hypotheses,* and can thus serve as a paradigm for probabilifying scientific and theological hypotheses. This kind of use of Bayes's theorem has been challenged and even rejected, if only because of the well-known problems besetting the determination of *non*-subjective values of the so-called 'prior probability' of the hypothesis at issue, as will be clear below. Yet Swinburne ([1990], p. 155) asserts exaggeratedly that 'Bayes's Theorem [. . .] is a crucial principle at work for assessing hypotheses in science, history and all other areas of inquiry.'

But if we do use Bayes's theorem to probability hypotheses, we must be mindful of a crucial distinction made by Hempel, yet unfortunately not heeded by Swinburne. W. C. Salmon ([forthcoming]) has lucidly articulated it as follows:

> Bayes's theorem belongs to the context of confirmation, not to the context of explanation [. . .] This is a crucial point. Many years ago, Hempel made a clear distinction between two kinds of why-questions, namely, *explanation-seeking*

> why questions and *confirmation-seeking* why-questions. Explanations-seeking why-questions solicit answers to questions about why something occurred, or why something is the case. Confirmation-seeking why-questions solicit answers to questions about why *we believe* that something occurred or something is the case. The characterization of nondemonstrative inference as inference to the best explanation serves to muddy the waters—not to clarify them—by fostering confusion between these two types of why-questions. Precisely this confusion is involved in the use of the 'cosmological anthropic principle' as an explanatory principle (here Salmon cites his book [1998]).

Swinburne likewise muddies the waters. He tries to use Bayes's theorem both to probability (i.e. to increase the confirmation of) the existence of God, on the one hand, and, on the other, to show that theism offers the best explanation of the known facts, assuming that God exists. And his account of the notation he uses in his statement of the theorem reveals his failure to heed the Hempel–Salmon distinction.

Thus, Swinburne tells us the following ([1991], pp. 64–65, p. 289): h represents the hypothesis to be probabilified incrementally; *'k* is our general background knowledge of what there is in the world and how it works' (p. 64); *'e* is our *phenomena to be explained* and other relevant observational evidence' (ibid., italics added); $p(h/e{\cdot}k)$ is 'the [posterior] probability of a hypothesis h on empirical evidence e and background knowledge k' (p. 281); $p(h/k)$ is the prior probability of h on k; $p(e/h \cdot k)$ is the 'likelihood' of e on the conjunction of h and k; and $p(e/k)$ is the 'expectedness' of e on k. But note importantly that Swinburne speaks of e both as the *explanandum* and as the 'relevant observational evidence', thereby rolling them into one, and running afoul of Salmon's caveat that 'Bayes's theorem belongs to the context of confirmation, not to the context of explanation'.

In this notation, the short form of Bayes's theorem asserts:

$$p(h/e \cdot k) = \frac{p(h/k) \times p(e/h \cdot k)}{p(e/k)}$$

Here the terminology is as follows:

$p(h/e{\cdot}k) =_{\text{Def.}}$ The 'posterior' probability of h on $e \cdot k$.
$p(h/k) =_{\text{Def.}}$ The 'prior' probability of h on k.
$p(e/h{\cdot}k) =_{\text{Def.}}$ The 'likelihood' of e on $h \cdot k$.
$p(e/k) =_{\text{Def.}}$ The 'expectedness' of e on k.

It is vital to distinguish the *absolute* confirmation of h from its *incremental* confirmation (Salmon [1975], p. 6). The former obtains iff the probability of h is fairly close to 1; the latter, also called 'relevant confirmation', is defined by the condition that the posterior probability of h be greater than its prior probability.

Upon dividing both sides of Bayes's theorem by the prior probability $p(h/k)$, it is evident that h is incrementally confirmed by e, iff $p(e/h \cdot k) > p(e/k)$, i.e. iff the likelihood exceeds the expectedness.

It is vital to be clear on what Swinburne takes to be the hypothesis *h* in his Bayesian plaidoyer for the existence of the God of theism. He tells us explicitly: 'Now let *h* be our hypothesis—"God exists" ([1991], p. 16) [. . .] Our concern is with the effect of various pieces of evidence on the proposition in which we are interested—"God exists"' ([1991], p. 18). And then he argued for the following conclusion ([1991], p. 291): 'On our total evidence theism is more probable than not.' Yet to reach this conclusion, he proceeds as follows: '[. . .] to start without any factual background knowledge (and to feed all factual knowledge gradually into the evidence of observation), and so to judge the prior probability of theism solely by *a priori* considerations, namely, in effect, simplicity' ([1991], p. 294, p. 63 n.). However, in Section **2.1,** I have already contended that the conceptual deliverances of *a priori* simplicity, even if they were coherent, cannot be at all mandatory for what is probably actually the case.

Above, I also advanced considerations that undermine Swinburne's theodicy. And I now add that the weakness of such a theodicy is shown further by the content of the Roman Catholic Exorcist Rite. It brings in Satan as a counterweight to God in order to reconcile divine omni-benevolence with such natural evils as death, declaring that Satan 'hast brought death into the world' ('Exorcism', *Encyclopedia Brittanica* [1929]). As Salmon ([1978] and private communication) interprets Hume's argument in the *Dialogues,* in the face of all the evil in the world, and of the hypothesis of an omnipotent omni-benevolent God, the likelihood of the evidence in the numerator of Bayes's theorem is less than the expectedness in the denominator. It then follows immediately from the theorem that the ratio of the posterior to the prior is less than one; that is, the total evidence *disconfirms* the existence of God.

Yet, even disregarding this devastating consequence, Swinburne's proposed additive agglomeration of posterior probabilities, starting with tautological evidence *k,* has a burden of proof that he did not address: The avoidance of some highly counter-intuitive results of Carnap's, which bedevil incremental confirmation. Salmon ([1975], pp. 14–6) has clearly summarized an array of them. One of them threatens Swinburne's assumption of additivity of probabilities: Two separate items of evidence e_1 and e_2 can *each* separately provide positive incremental confirmation for a given *h,* while their conjunction $e_1 \cdot e_2$ incrementally *disconfirms h*! Swinburne assumes unwarrantedly that the posterior probability is a monotomically increasing function under the conjunctive enlargement of e_n (n = 1, 2, ...).

Again, even leaving both of these great hurdles aside, there is a yet further major difficulty that Swinburne likewise does not address, let alone overcome. And the latter alone would suffice to undermine his agglomeration argument.

5.3 The problem of 'old evidence'

Old evidence is constituted by facts already known. But, if a hypothesis (e.g. Darwinian evolutionary theory) *retrodicts* past events that were not previously known, then

evidence of the occurrence of these events does count as new evidence, no less than successfully predicted events. More generally, as Salmon has put it so well (private communication), Bayes's theorem is a device for updating the appraisal of a hypothesis on the basis of new or previously unavailable, or unconsidered evidence.

Now, Swinburne tells us regarding his agglomerative program of adding posterior probabilities that 'any division of evidence between *e* and *k* will be a somewhat arbitrary one. Normally, it is convenient to call the latest piece of observational evidence *e* and the rest *k*; but sometimes it is convenient to let *e* be all observational evidence and let *k* be mere tautological evidence' ([1991], p. 65). Yet in the case of old evidence as defined, i.e. facts already known, how can Swinburne *avoid* conceding that the expectedness in the denominator is equal to 1, and argue effectively that it is less than 1? The circumvention of an expectedness equal to 1 is crucial, if there is to be incremental confirmation of *h*: As noted in Section **5.2,** the condition for such confirmation is that the likelihood in the numerator exceed the expectedness in the denominator. But since no probability value or product of such values can exceed the value 1, this condition for incremental confirmation cannot be met if the expectedness equals 1.

What, then, does Swinburne need to accomplish in order to avoid this untoward result? He absolutely must be able to *split off* a given piece of old evidence *e* from what remains from the old background knowledge *k,* such that *k* does not still entail *e.*

Deborah Mayo ([1996], p. 334 and fn. 10 there) reports that several authors have insisted that probability assignments should have been relativized to current knowledge *minus e.* Or, as urged by Paul Horwich, that although the expectedness of old evidence is actually 1, a 'Bayesian should assess how much *e* would alter our degree of belief assignment to *h* relative to "our epistemic state prior to the discovery" of *e,* when its probability was not yet 1' (Mayo [1996], p. 334 and fn. 10 there). If such splitting off could succeed, then the expectedness would no longer be prima facie 1. Philip Quinn has emphasized a caveat for me (private correspondence): Unless we allow such splitting off of *e,* Bayes's theorem cannot be useful in the confirmation of a hypothesis by known facts. Thus the question now becomes: Can the required splitting off of *e* succeed? Let me give my own reasons for a negative answer by means of two concrete illustrations.

As we saw, Swinburne offers the existence of laws of nature as evidence *e* supporting the existence of God. And he also adduces that hypothesized existence, in turn, as the sole explanation of natural lawfulness, an explanatory claim in which he is joined by Quinn ([1993], pp. 607–8). But, assuming that the laws *e* have been split off, consider the complement-subset of the already known background knowledge, which supposedly now *excludes* the laws of nature. Surely, that complement-class will still include a vast array of practical knowledge by means of which we are able to control our environment and survive at all. Yet just that practical knowledge *inextricably involves the laws of nature.* Thus, when we go ice-sledding on a (partially) frozen lake, we count on the lawful anomalous expansion of water, as we do when we expect icecubes to float upon being dropped into water at room temperature. Other examples

in point are legion. For instance, our technological knowledge of the use of color filters depends essentially on our cognizance of the lawful spectral decomposition of white light. It emerges that the attempt to split off the laws of nature, as required by Swinburne's program fails. Philip Quinn likewise did not spell out how he would achieve the splitting off he advocated.

Marek Druzdzel (private communication) has retorted to these objections that, if they were sound, a jury of Bayesians could never convict a murderer who is caught with a smoking gun on the basis of that old evidence. To this, Salmon (private communication) has offered the cogent rejoinder that, in this juridical context, the jury is duty-bound to start with the presumption of innocence, and that it seems unfeasible to factor this normative legal point into a *de facto* prior probability. Thus, this high-profile crime example does not gainsay my claim that Swinburne's handling of old evidence fails.

Quite generally, in the chapter of Earman's ([1992], Ch. 5) entitled 'The Problem of Old Evidence', he drew the following conclusion regarding the status of old evidence (p. 135): '[. . .] the Bayesian account of confirmation retains a black eye.'

I conclude that Swinburne and other Bayesians have failed to solve the problem of old evidence. Even more importantly, as we saw, Swinburne's avowed program ([1991], p. 291) to probabilify the existence of God cumulatively as exceeding one-half has likewise been unsuccessful: He has failed to establish that the posterior probability of the existence of God exceeds one-half. *A fortiori* he has failed to show, in turn, that the hypothesis of the existence of God can serve as a warranted premise to provide explanations.

6 Conclusion

None of the cross-section of diverse theists, past and present, whose arguments I have considered has presented cogent evidence for the existence of his/her God.

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Notes

1 In 1931, Rudolf Carnap (Schleichert [1975]) explained in a major paper that the noun 'Nothingness' is a product of logical victimization by the grammar of our language.
2 Quoted in Leslie ([1978], p. 181) from Bergson's *The Two Sources of Morality and Religion,* Part 2.
3 Cited in Quinn ([1993], p. 605) from Leibniz's *Philosophical Papers and Letters.*
4 Quoted in Parsons ([1989], p. 81).
5 As I was putting the finishing touches to this paper, Swinburne made me aware of his Aquinas Lecture *Simplicity As Evidence of Truth* ([1997]). I regret that it was too late to deal with it here.
6 Quinn and Swinburne quantify the 'amount of matter energy', which clearly depends, however, on the choice of units, as well as on the zero of energy in the pertinent physical theory. Does God's supposed creative decree contain such mundane specifications?
7 Swinburne ([1991], p. 103) rejects occasionalism as an 'untenable view' of the relation between scientific and theological explanation.
8 For criticisms directed at the particulars of Swinburne's recourse to religious experience, see Martin ([1990], Ch. 6) and Gale ([1994]).
9 For numerous relevant details, see Leslie ([1990], Ch. 1, Section 1.4).

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2

Prof. Grünbaum on the "Normalcy of Nothingness" in the Leibnizian and *Kalām* Cosmological Arguments

William Lane Craig

Introduction

Adolf Grünbaum has recently extended his critique of theological (mis)interpretations of current physical cosmology (Grünbaum [2000]; cf. Grünbaum [1996]). As part of that critique he essays to show that two versions of the cosmological argument--the Leibnizian cosmological argument and the *kalām* cosmological argument—both presuppose what Grünbaum calls the spontaneity or normalcy of nothingness, which he takes to be unjustified.[1] I shall show that neither of these two forms of the cosmological argument makes such a presupposition, but that Grünbaum's critique nevertheless serves to highlight an assumption which is vital to the success of the *kalām* cosmological argument, an assumption, moreover, which Grünbaum rejects. But I shall try to show that Grünbaum's reasons for rejecting this quite plausible and commonly held assumption are flawed, so that the *kalām* argument survives his critique intact.

The Leibnizian Cosmological Argument

In his "The Principles of Nature and of Grace, Based on Reason," Leibniz presents the following argument for the existence of God:

> *nothing happens without a sufficient reason*; that is to say, . . . nothing happens without its being possible for him who should sufficiently understand things, to give a reason sufficient to determine why it is so and not otherwise. This principle laid down, the first question which should rightly be asked, will be, *Why is there something rather than nothing?* For nothing is simpler and easier than something. Further, suppose that things must exist, we must be able to give a reason *why they must exist so* and not otherwise.

> Now this sufficient reason for the existence of the universe cannot be found *in the series of contingent things*, that is, of bodies and of their representations in souls; for matter being in itself indifferent to motion and to rest, and to this or another motion, we cannot find the reason of motion in it, and still less of a certain motion. And although the present motion which is in matter, comes from the preceding motion, and that from still another preceding, yet in this way we make no progress, go as far as we may; for the same question always remains. Thus it must be that the sufficient reason, which has no need of another reason, be outside this series of contingent things and be found in found in a substance which is its cause, or which is a necessary being, carrying the reason of its existence within itself; otherwise we should still not have a sufficient reason in which we could rest. And this final reason of things is called *God* (Leibniz [1951a]: 527–8).

As Grünbaum analyzes it, the Leibnizian cosmological argument involves three main contentions:

(i) If there is a world at all, then its 'normal,' natural, spontaneous state is one of utter nothingness or total non-existence, so that
(ii) the very existence of matter, energy and living beings constitutes a *deviation* from the allegedly 'normal,' spontaneous state of 'nothingness,' and
(iii) that deviation must thus have a suitably potent (external) divine cause (Grünbaum [2000]: 1).

It is a striking feature of this analysis that Leibniz in fact makes *none* of these contentions. They are more apt characterizations of the thought of Thomas Aquinas than of Leibniz.

In a response to Grünbaum's earlier critique, I charged that Grünbaum had conflated the Leibnizian cosmological argument with a distinct version of the cosmological argument, namely, the Thomist cosmological argument (Craig [1994c], 247). In his present critique Grünbaum repudiates the charge, claiming to "have documented . . . that, contrary to Craig, Leibniz's cosmological argument does presuppose SoN [spontaneity of nothingness]" (Grünbaum [2000]: 14). But a close reading of his critique discloses that Grünbaum fails to make good on this claim. He cites as illustrative of this presupposition, not Leibniz, but Richard Swinburne's statement:, "It is extraordinary that there should exist anything at all. Surely the most natural state of affairs is simply nothing: no universe, no God, nothing. But there is something" (Swinburne [1996]: 48). In response to Swinburne's claim, Grünbaum first indicts Swinburne's use of the word "extraordinary," which Grünbaum takes in the literal sense of "out of the ordinary" (Grünbaum [2000]: 3). Accordingly, he blasts Swinburne's assertion that "it is extraordinary that there should exist anything at all" as an "outlandish" "case of special pleading," since the most ordinary feature of our experience is our immersion a sea of existence (Ibid). But Grünbaum's protest on this score is surely a case of unsympathetic pedantry. By "extraordinary" Swinburne obviously meant something like "remarkable" or "surprising" or "in need of explanation," not literally "out of the ordinary." Swinburne's

claims is not refuted by the observation that we are surrounded by existents, for it is precisely that observed fact which strikes one as remarkable or in need of explanation.

Grünbaum then proceeds to "recast" Swinburne's claim that "the most natural state of affairs is simply nothing" to read "The most natural state of the existing world is to *not* exist at all" (Grünbaum [2000]: 4). The point of this reformulation is at first bewildering. For Grünbaum has re-formulated Swinburne's at least apparently coherent claim into one that is obviously incoherent, since the non-existence of an entity cannot reasonably be taken to be a state of that entity. By means of his reformulation Grünbaum represents proponents of the Leibnizian cosmological argument as assuming that "if there is a world at all, then its 'normal,' natural, spontaneous state is one of utter nothingness or total non-existence" (Grünbaum [2000]: 1). I cannot think of any natural theologian in the history of Western thought who embraced this incoherent assumption. So when Grünbaum asks, "How can *non-existence* at all be *coherently* a state, natural or otherwise, of the actual, existing world?" (Grünbaum [2000]: 4), his conundrum is of his own manufacture.

As one continues to read Grünbaum's critique, however, the point of the reformulation becomes discernible. Grünbaum's reformulation of Swinburne's statement is intended to restrict the scope of the normalcy of nothingness to *the world,* where "world" does not mean "maximal state of affairs," but "physical universe." His allegation, then, is that Leibnizians have assumed that the most natural state of the physical universe is non-existence, which Grünbaum takes to mean that the "spontaneous, externally undisturbed, or normal" state of the universe is non-being (Grünbaum [2000]: 5). But wholly apart from the noted incoherence of this reformulation, Grünbaum's recasting misconstrues both Leibniz and Swinburne's arguments by unduly restricting their scope. As Swinburne makes clear, he is asking for a sufficient reason for the existence of anything at all, not just of the universe. As for Leibniz, the unrestricted nature of the question *Why is there something rather than nothing?* serves to belie Grünbaum's claim that it (implicitly) presupposes the normalcy of nothingness. It is true that Leibniz takes it for granted that the existence of anything does require explanation. This is demanded by the Principle of Sufficient Reason. But contrary to Grünbaum, that assumption does not entail Swinburne's claim that the most natural state of affairs is nothingness. It must be kept in mind that for Leibniz (in contrast to Swinburne) God's existence is broadly logically necessary, so that a state of nothingness is logically impossible. Hence, Leibniz *cannot* be assuming that a state of absolute nothingness is the natural or normal state of affairs, as Swinburne does.

It is true that Leibniz tries to motivate his initial question *Why is there something rather than nothing?* by stating, "For nothing is simpler and easier than something" (Leibniz [1951a]: 527). Grünbaum takes this claim to be an enunciation of the spontaneity of nothingness on Leibniz's part. So in response to Leibniz's claim Grünbaum asks, "Why is this *conceptual* claim, if granted, mandatory for what is the ontologically spontaneous, externally undisturbed state of the *actual* world? Alas, Leibniz does not tell us here" (Grünbaum [2000]: 8). But Leibniz is not here affirming that the ontologically natural state of affairs is nothingness, since he believed that such a state of affairs is metaphysically impossible. Rather he may be plausibly taken to be

speaking in general about the contrast between nothingness and something's existing. Something's existing is always more complicated than nothingness because, as Leibniz goes on to say, things *"must exist so* and not otherwise" (Leibniz [1951a]: 527). There is a particularity to being in contrast to non-being that makes being less simple than non-being. Moreover, nothingness may be said to be easier than something's existing in that no explanation seems to be required for nothing. There just is not anything to be explained in nothingness, whereas in something's existence there is both the thing itself and its particularity which present themselves to us. Indeed, if absolutely nothing existed, it is difficult to see how there could be an explanation of this, for there would not exist anything; whereas if something exists it is at least epistemically possible that this is explicable.

Since Leibniz's query is "the first question which should rightly be asked" (Leibniz [1951a]: 527), we do not yet know if there exists a metaphysically necessary being. We might well, therefore, be surprised that something exists rather than nothing, given the greater comparative simplicity and ease of there being nothing. This train of thought will lead us to the conclusion that the state of absolute nothingness is metaphysically impossible, that is to say, there exists a necessary being. So understood, Leibniz's argument not only does not presuppose, but stands in stark contradiction to, Grünbaum's alleged assumption of the normalcy of nothingness.

Even with respect to the physical universe, moreover, Leibniz did not hold that the natural or normal state of affairs is the non-existence of the physical universe, for he held (notoriously) that God's creation of the world is, like God Himself, necessary. Rather what he argues is that neither anything in the universe, nor the universe as a whole, nor past states of the universe supply a sufficient reason for why anything at all exists (Leibniz [1951b]: 345–6). This is because there appears to be nothing intrinsic to them that would necessitate their existence or their being so and not otherwise. Therefore, there must be an external ground which carries the reason for its existence in itself. The presupposition of the normalcy of nothingness plays no role in the argument at all.

The germ of truth in Grünbaum's analysis is that Leibniz did hold that the universe is not self-explanatory and requires therefore some sufficient reason external to it for its existence. That most atheists lack the temerity to assert that the universe is broadly logically necessary in its existence suggests that Leibniz's position on this score is hardly the case of metaphysical skullduggery which Grünbaum makes it out to be. Indeed, what, we may ask, is Grünbaum's preferred alternative? Does he think that the existence of a physical, spacetime universe is self-explanatory and metaphysically necessary? Or does he regard the existence of the universe as a brute contingent? An affirmative answer to the first question requires some refutation of Leibniz's argument that the universe is not self-explanatory, while an affirmative answer to the second would require rejection of the requirement of the Principle of Sufficient Reason that anything that exists has an explanation of its existence. It is unclear which alternative Grünbaum embraces.

Grünbaum goes on to argue that whether some phenomenon calls for explanation is theory-relative, but his argument seems neutral with respect to the above two alternatives. He first provides a number of examples to show that phenomena which

cry out for explanation in the context of one theory are not taken to require explanation in the context of another. The implication drawn from these examples seems to be that the existence of the universe is therefore neither inherently self-explanatory nor inherently in need of explanation. Rather whether a call for an external explanation of the universe's existence is warranted is theory-relative. It is clear that Grünbaum believes that relative to the Standard Big Bang Model of the origin of the universe it is conceptually inappropriate to ask for an explanation of the existence of the universe (Grünbaum [1991]: 248). What remains unclear is whether Grünbaum thinks that the existence of the universe is therefore metaphysically necessary or simply a brute fact.

In either case Grünbaum's claim to have thereby averted the Leibnizian call for an explanation of the existence of the universe faces several difficulties: (1) Even if we concede the relativity of *explananda* to scientific theories, it is simply not the case that on current cosmological theory the existence of the universe is taken not to require explanation. As I have argued elsewhere (Craig [1994a], 335–7), classical and quantum cosmological models, as essentially descriptive accounts of the origin of the universe, make no assertion whatever as to whether the existence of the universe is natural or not. Grünbaum has yet to answer my challenge to provide any criterion of "naturalness" which would serve to show that an uncaused origin of the universe is natural.

(2) Even if the uncaused origin of the universe were natural relative to the Standard Big Bang model, that would not imply that the origin of the universe does not cry out for explanation. Instead, it might lead one to reject the theory relative to which such an origin is said to be natural. That this is so is especially evident in the case of theorists who are discomfited by the absolute origin of the universe featured in the Standard Big Bang model. Inflationary theorist Andrei Linde finds motivation for his past-eternal Chaotic Inflationary Model precisely in this feature of the Standard Model: "The most difficult aspect of this problem is not the existence of the singularity itself, but the question of what was *before* the singularity . . . . This problem lies somewhere at the boundary between physics and metaphysics" (Linde [1984]: 9760).[2] Linde's extrapolation of his model to the infinite past was rooted, not in any empirical inadequacy of the Standard Model, but in the conviction that the absolute beginning predicted by that model was not acceptable as an explanatory stopping point. Although Borde and Vilenkin demonstrated that Linde's inflationary model was geodesically incomplete in the past and therefore itself involved an initial cosmological singularity, they did not conclude that the question of the origin of the universe was therefore a pseudo-problem; rather they wrote, "The fact that inflationary spacetimes are past incomplete forces one to address the question of what, if anything, came before" (Borde and Vilenkin [1994]: 3308). Misner, Thorne, and Wheeler declare that "No problem of cosmology digs more deeply into the foundations of physics than the question of what 'preceded' the 'initial state' of infinite (or near infinite) density, pressure, and temperature" (Misner, Thorne, and Wheeler [1973]: 769). The fact is that a whole series of cosmological models have been proposed over the last half-century specifically to avoid the absolute beginning predicted by the Standard Model. Had these theorists been content to rest with Grünbaum's maxim that on the Standard Model the origin of the universe is just natural and therefore requires no explanation, the history of contemporary cosmology over

the last several decades would have been considerably less interesting and the Standard Model would not have enjoyed the corroboration it has received through the repeated failure of alternative theories. It is therefore incumbent upon Grünbaum to address the questions posed above concerning his alternative to the Leibnizian position, for if it is implausible that the existence of the universe is either metaphysically necessary or a brute fact, then we shall, on the assumption that *explananda* are theory-relative, seek some other theory of cosmic origins than the Standard Model.

(3.) The theory-relativity of *explananda* is inapplicable to metaphysical questions. Leibniz's question *Why is there something rather than nothing?* is a metaphysical, not a scientific, query and therefore cannot be relative to mere physical theories. That this is the case is evident from the fact that a theistic Big Bang model, according to which God created the initial cosmological singularity and everything then proceeded just as described in the Standard Big Bang Model, would be *indistinguishable* from the Standard Model. As physical theories these two models are identical; they differ only in their metaphysical commitments. Leibniz's question is therefore metaphysical in nature and its appropriateness cannot be context-dependent upon some theory of physics. Indeed, if we say that Leibniz's question is theory-relative, being inappropriately posed within the context of Standard Big Bang cosmology, then it would become impossible ever to have empirical evidence that the (non-theistic) Standard Model is correct or that the existence of the universe is natural, since such a theory is empirically indistinguishable from its theistic counterpart. This is ironic, since it is Grünbaum who indicts the proponents of the spontaneity of nothingness for having no empirical evidence in favor of their position.

In sum, Grünbaum has failed in both his aims, first, to show that the Leibnizian demand for an explanation of why there is something rather than nothing is predicated on the assumption that the most natural state of affairs is nothingness, and, second, to show that the Leibnizian demand is ill-founded.

The *Kalām* Cosmological Argument

The Normalcy of Nothingness in the *Kalām* Argument

In his *Kitab al-Iqtisad* the great medieval Muslim theologian al-Ghazali presented the following simple syllogism in support of the existence of a Creator: "Every being which begins has a cause for its beginning; now the world is a being which begins; therefore, it possesses a cause for its beginning" (al-Ghazali [1962]: 15-6). By "the world" al-Ghazali means the physical universe. Modern physical cosmogony has provided startling and strong support of al-Ghazali's second premise, thereby resuscitating the ancient *kalām* cosmological argument.

Grünbaum, however, alleges that the *kalām* cosmological argument, like the Leibnizian argument, is "likewise predicated, though only quite tacitly and insidiously, on the baseless SoN [spontaneity of nothingness]" (Grünbaum [2000]: 14).[3] Grünbaum commences his critique by simply asking why else one would assume that a universe which begins to exist requires an external creative cause at all. "Is it not because Craig

tacitly embraces SoN and uncritically assumes that the externally uncaused, natural state of the world is one of nothingness?" (Grünbaum [2000]: 15). Well, no, that cannot be why, since I regard it as patently incoherent to say that the natural state of the world (=universe) is one of nothingness. Rather the reason I believe that "a universe which begins has an external creative cause" is because that conclusion follows deductively from the truth of the argument's two premises! Presumably, then, Grünbaum, in saying that the argument assumes its conclusion, must be alleging that the argument is question-begging. But this is surely not the case. An argument is question-begging if one's only reason for accepting one of its premises is that one already accepts the conclusion. But the evidence for the second premise is clearly independent of the argument's conclusion; and as for the first premise, I and, I daresay, most people believed this premise long before we ever knew that the universe had a beginning or contemplated there being a creative cause of its beginning.

Grünbaum, however, thinks that the assumption of the spontaneity of nothingness is "subtly present" in my claim that it seems inconceivable that the universe should come into existence if, as atheism must hold, there was not even the prior potentiality for its existence (Grünbaum [2000]: 16). Grünbaum responds,

> But what reason is there in the temporally unbounded big bang model for claiming that the big bang universe ever '*became* actual'? The most immediate reason seems to be the ill-founded SoN, and the question-begging supposition that 'the potentiality of the universe's existence lay in the power of God to create it', a potentiality, which then required divine creation to be actualized (Grünbaum [2000]: 16).

Now there are three distinct claims here that need to be sorted out.

First, the claim that the argument is question-begging in positing a divine creative cause is clearly mistaken, since this *explanans* represents merely the classical theist's account of how it is that the universe could come to exist if there were no prior potentiality in things for its existence (Thomas Aquinas [1948], 1a. 46. 1 *ad* 1). It is not a premise in the argument, but simply the theist's answer to the question to which the atheist has no answer.

Second, does the claim that the universe became actual presuppose the normalcy or spontaneity of nothingness? Grünbaum does not here explain why he thinks that it does. In an earlier piece, he recognized that when the theist speaks of creation *ex nihilo* or of the universe's coming into existence out of nothing, he is not implying the existence of a state of nothingness prior to the Big Bang singularity (Grünbaum [1994]: 228). So in affirming that the universe became actual one is not assuming the normalcy of nothingness in that sense. In the same piece Grünbaum sought to expose the theist's assumption of the spontaneity of nothingness in the call for a *ratio essendi* (reason for being) of the world (Grünbaum [1994]: 229). Grünbaum correctly sees the Thomistic demand for a conserving cause of the world as rooted in the assumption that contingent beings have a disposition to nothingness. This is because on Thomas's quasi-Aristotelian metaphysic finite beings are composed of form and matter and so are subject to corruption or, in the case of pure forms, prime matter itself, and beings in which their matter is fully actualized by their forms, at least composed of essence and

existence (see Craig [1980]: 189-92). Since no finite being's essence includes existence, there must, if such finite beings are to exist, be an external cause which continually bestows the act of being upon their respective essences. For that reason Grünbaum is correct in seeing the spontaneity of nothingness to lie at the heart of the Thomist cosmological argument.[4] But it is also clear that such a metaphysic plays no role in Leibniz's argument nor does it underlie the *kalām* cosmological argument. So again, it is simply a mistake of historical exposition to see the *kalām* argument as presupposing the normalcy of nothingness in this sense. But if the argument presupposes the spontaneity of nothingness in neither of these two senses, then in what sense does it presuppose it? Grünbaum does not tell us.

Third, then, why does the proponent of the *kalām* cosmological argument affirm that in beginning to exist the universe became actual? The answer is that *the proponent of the kalām cosmological argument is presupposing the tensed theory of time.* The real merit of Grünbaum's critique lies in his surfacing this presupposition. The reason that Grünbaum is so baffled by the claim that the beginning of the universe implies that the universe became actual at that moment is because Grünbaum holds to a tenseless theory of time, according to which temporal becoming is not an objective feature of the physical world, but a mind-dependent phenomenon. As he wrote in an early work, "coming *into* being (or 'becoming') is *not* a property of physical events themselves but only of human or conscious awareness of these events" (Grünbaum [1967]: 153). Objectively speaking, events occur tenselessly at their respective times; but their coming into being is purely subjective:

> Since an event comes into being by *occurring now, the coming into being or becoming an event, as distinct from its mere tenseless occurrence at a certain time, is thus no more than the entry of some of its temporally proximate effects into the immediate awareness of a conceptualizing organism man* (Grünbaum [1967]: 153).

That Grünbaum tacitly presupposes such a tenseless theory of time in his present critique is evident in such remarks as the following:

> But, why, I ask, does a big bang universe that 'begins to exist', in the special sense that there were no instants of time preceding all of the moments in the metrically finite unbounded past, require an external creative cause at all . . .? . . . Once we abandon [Craig's] misleading language of 'coming *out of* nothing', we can describe the situation as follows: The big bang models feature a world whose past time is unbounded (open) but metrically finite in years. Absent the tacit presupposition of the baseless SoN, there is just no cogent reason for requiring an external creative cause for the existence of that world! (Grünbaum [2000]: 16, 17).

The absence of temporal becoming from Grünbaum's description of a world with a beginning is striking. The world does not come into being or become actual at the Big Bang; it just exists tenselessly as an ordered extension of points which is topologically open in the past-time direction but metrically finite. Now I agree with Grünbaum that if time is tenseless, then the universe never really comes into being or becomes actual

and that therefore the quest for a cause of its coming into being is misconceived. In that case, it would be the Leibnizian question which should rightly be asked, *Why is there (tenselessly) something rather than nothing?* But there would be no reason to look for a cause of the universe's beginning to exist, since on tenseless theories of time the universe did not truly begin to exist, except in the special sense that the spacetime manifold is finite in the *earlier than* direction.[5]

In affirming that the universe began to exist, the proponent of the *kalām* cosmological argument assumes the following understanding of that notion, where "*x*" ranges over any entity and "*t*" ranges over times, whether instants or moments:

1. *x* begins to exist at *t* iff *x* comes into being at *t*.
2. *x* comes into being at *t* iff (i) *x* exists at *t,* and the actual world includes no state of affairs in which *x* exists timelessly, (ii) *t* is either the first time at which *x* exists or is separated from any $t' < t$ at which *x* existed by an interval during which *x* does not exist, and (iii) *x*'s existing at *t* is a tensed fact.

The key clause in (2) is (iii). Since Grünbaum denies the tensed theory of time, he denies that the universe's first existing at a first moment of time represents the moment at which the universe came into being.[6] Thus, he denies that the universe began to exist in the sense explicated in (1).

The Objectivity of Temporal Becoming

The real issue separating Grünbaum and the proponent of the *kalām* cosmological argument is not, therefore, the red herring of the so-called normalcy of nothingness, but rather the objectivity of temporal becoming. Let us examine, then, the three reasons which Grünbaum offers for his denial of mind-independent temporal becoming.

Grünbaum's first argument is that a tensed conception of "nowness" trivializes statements like "It is now 3 p.m.":

> It must construe the assertion 'It is 3 P.M., EST., now' as claiming *non-trivially* that when the clock strikes 3 P.M. on the day in question, this clock event and all the events simultaneous with it intrinsically have the unanalyzable property of nowness or presentness. But I am totally at a loss to see that anything non-trivial can possibly be asserted by the claim that at 3 P.M. nowness (presentness) inheres in the events of 3 P.M. For all I am able to discern here is that the events of 3 P.M. are indeed those of 3 P.M. on the day in question! (Grünbaum [1967]: 20).

Grünbaum's difficulty is analogous to those who cannot see what non-trivial claim is being made when it is asserted that α is the actual world. For every world is actual at or in itself. So to say that α is actual is to assert the triviality that α is actual in α! In a similar way, to claim that 3 p.m. is now is to assert the triviality that it is 3 p.m. at 3 p.m.!

But to assert that α is actual is not, of course, the same as asserting that α is actual in α, and in the same way, to say 3 p.m. is now is not to utter the tautology that 3 p.m. is 3 p.m.

To say that α is actual is to pick out the one and only world of all possible worlds that is actual. To say that it is now 3 p.m. is to pick out the one and only time of all possible times that has (present-tense) actuality. On a tensed theory of time nowness or, better, presentness is a restricted form of actuality, a tensed form, to be more precise. "Now" serves to designate what is (present-tense) actual, what segment of the temporally parameterized actual world obtains (present-tense). This tensed characterization of nowness does not serve to analyze "now" reductively in terms of actuality alone; but it serves to articulate nowness in terms of actuality rather than mind-dependence. The notion of present-tense actuality, like actuality itself in possible worlds semantics, seems to be a well-understood primitive notion. That the claim that some time is present is non-trivial is evident from the fact that it implies an ontology vastly more modest than that of the tenseless theory. For on a consistent tensed theory of time--what Fitzgerald calls a "reality acquisition model" of temporal becoming (Fitzgerald [1974]: 260) --, only the present obtains or is actual. The past and the future can be said to exist in the sense that non-actual past and future states of affairs exist, though neither obtains. There is this difference between them: the past *has been* actual, whereas the future *has yet* to be actual. But both are (present-tense) non-actual. The states of the past and the future are thus like non-actual possible worlds: they exist but do not obtain. Events/things which exist at any non-present time *t* are thus the analogues of merely possible objects and cannot, accordingly, be intelligibly said to exist. The only events/things that exist are present events/things--hence, the more modest ontology of the tensed theory.

Grünbaum's second argument is for him the most important: physics knows nothing of temporal becoming. He writes,

> It seems to me of decisive significance that no cognizance is taken of nowness (in the sense associated with becoming) in any of the extant theories of physics. If nowness were a fundamental property of physical events themselves, then it would be very strange indeed that it could go unrecognized in all extant physical theories *without detriment to their explanatory success.* And I hold with Reichenbach that 'If there is Becoming [independently of awareness] the physicist must know it'(Grünbaum [1967]: 20).

Grünbaum's second argument thus rests on two premises:

1. The extant theories of physics take no cognizance of nowness or temporal becoming. and
2. If temporal becoming is an objective feature of physical events, then explanatorily successful physical theories must take cognizance of it.

Notice that it does *not* follow from these two premises that temporal becoming is not an objective feature of physical events; it could rather be the case that the extant theories of physics are not explanatorily successful! Grünbaum needs the additional premise

3. The extant theories of physics are explanatorily successful.

His argument now becomes valid, and the question, then, is whether these premises are true.

Ironically, it is tenseless time theorists themselves who have in recent years been most sharply critical of (1). For example, in his *Time's Arrow and Archimedes' Point* Huw Price issues a ringing call for a wholesale reform of physics in order to make it truly tenseless by achieving what he calls an Archimedean perspective, a sort of "view from nowhen." Price argues that all of the customary, physical "arrows of time" are insufficient to give time a direction but, on the contrary, actually presuppose the directionality of time. For example, absent temporal becoming, ". . . we have no right to assume that it is an objective matter that entropy *increases* rather than *decreases*. . . . What is objective is that there is an entropy gradient over time, not that the universe 'moves' on this gradient in one direction rather than the other" (Price [1996]: 48). Similarly, concerning the cosmological arrow of time, he points out that it is not an objective matter of fact which end of the spacetime manifold is the Big Bang and which the Big Crunch. "Nothing in physics tells us that there is a wrong or a right way to choose the orientation of the temporal coordinates. *Nothing in physics tells us that one end of the universe is objectively the start and the other end objectively the finish*" (Price [1996]: 84). Given time reversal invariant laws, there is just no reason for us to think of one end of the universe as expanding and the other as contracting. As a tenseless time theorist Price believes that contemporary physics needs to be thoroughly overhauled to make it truly tenseless. The change will be radical: "the ordinary temporal perspective is so familiar, and so deeply imbedded, that we need to be suspicious of many of the concepts used in contemporary physics. We can't simply assume that familiar concepts will carry over smoothly to an Archimedean physics" (Price [1996]: 234).

If Price's analysis is even approximately correct, then it explodes Grünbaum's contention that the extant theories of physics take no cognizance of temporal becoming. On the contrary, they are imbued with it. It would be unavailing for Grünbaum to answer that it is merely temporal anisotropy that is at stake here, for that is manifestly incorrect: even if time were anisotropic, it would still be wholly conventional which direction we choose to call "earlier" and which "later." Yet physical cosmology, for example, treats the Big Bang as the origin, not the end, of the universe. It is time's directedness, not just its anisotropy, which is at issue here.

Ironically, Price would probably agree with Grünbaum's (2) but would deny (3), that the extant theories of physics are explanatorily successful (Price [1996]: 259). Their explanatory inadequacy stems, in his view, from their implicit reliance on the objective reality of temporal becoming. If it is really this assumption that does the heavy lifting in accounting for temporally asymmetric physical processes, then given the mind-dependence of becoming, the extant theories of physics must be explanatorily deficient. From the standpoint of the tensed time theorist, however, it is exactly this presupposition that helps to make physical theories explanatorily adequate. Price's indictment of contemporary physics *presupposes* the mind-dependence of becoming, which is precisely the point to be proved. Thus, even if an Archimedean revolution were to transpire, thoroughly de-tensing physics, so that (1) did become true, the tensed time theorist would probably be sceptical that (3) would remain true. Price gives no reason to think that an Archimedean physics will be explanatorily adequate for the physical phenomena he discusses; and if such a physics forces us to abandon such claims as that the Big Bang occurred at the beginning of the universe, then its

explanatory adequacy has been purchased only at the price of denying obvious facts about the world, in which case one has no reason to accept (2).

Finally, even given a de-tensed physics, we have reason to call (2) into question. It is only because Grünbaum is presupposing the legitimacy of the positivistic reduction of time to physical time that he is able to claim that temporal becoming, being absent from physical time, is therefore non-existent. For on his view there is no time apart from physical time in which temporal becoming might lodge. But if we distinguish between time itself and our physical measures thereof and locate the seat of temporal becoming in the former, then why should we expect that that feature of time should be preserved in the abstraction of physical time? On the contrary, given the universal character of scientific theories, we should expect precisely the opposite, as Max Black explains:

> It is easy to understand why theoretical physics should express its formal results in a language that is independent of context, using formulas or sentences from which the occasion words are absent. This procedure has the great advantage of no reconstruction of the original context being required on the part of any reader . . . . If a scientist were to say, 'I *then* saw a green flash at the edge of the sun's disk,' anyone who was absent at the time of the original observation would need to know *who* spoke, and where and when, in order to obtain the intended information. No such supplementary information is needed in order to understand Boyle's law or any other freely repeatable scientific statement (Black [1962]: 181).

But if the universality of scientific theories precludes capturing nowness in physical theory, does that imply that, if temporal becoming is an objective feature of physical events, theories about those events are likely to be explanatorily inadequate, as Grünbaum alleges? Not necessarily. For science's abstraction from indexical elements in the formulation of theories is one of its means of achieving explanatory adequacy, for the theories are then applicable at all times, thus contributing to their generality and utility.

The role of time in physical theories can thus be very misleading philosophically. The variable *t* is only a shadow of time itself, as Cleugh emphasizes:

> The '*t*' of physics is improperly called *time*: it should be *time-interval*. It is an abstraction from lived time, and in the process all that is distinctively temporal has been eliminated. Past, present, and future have gone: in their stead remains only the logical relation of before and after, expressed in terms of numbers . . . . In abstracting from this, in refusing to consider diversities, which, from their point of view, are irrelevant, and in concentrating on time as serial, as a homogeneous continuum, [those who measure time] have rendered the passage of time susceptible to mathematical treatment. This is a loss, in that certain aspects are ignored, but it is also a great gain in that its clarity and simplicity make further development possible (Cleugh [1937]: 46-7).

The physical concept *t* lacks nowness, but that does not permit an inference about time itself. Moreover, since *t* represents a number, mathematical operations can be

carried out on it which make no sense with respect to time itself; for example, *t* can be assigned negative or even imaginary values. As Cleugh nicely puts it, "What is the wildest absurdity of dreams is merely altering the sign to the physicist" (Cleugh [1937]: 46). If he can find no metaphysically intelligible interpretation of such operations, the metaphysician will regard them merely as mathematical "tricks" without ontological import. So wide is the gap between the ordinary notion of time and the physicists' *t* that Black advised physicists to stop talking about "time" and to refer to their own concept simply as "*t*"! (Black [1962]: 182). This is no doubt asking too much; but it is surely not too much to ask philosophers and physicists to refrain from drawing metaphysical conclusions about the unreality of objective temporal becoming on the basis of its absence from the eidolon of time which appears in physical theory.

Grünbaum's third argument in favor of the mind-dependence of becoming is that the tenseless theory is free of an "important perplexity" which besets the view that temporal becoming is real (Grünbaum [1967]: 26; cf. 21), namely, why do the events which are now happening in 1965 become present in 1965 rather than at some other time? Grünbaum amplifies J. J. C. Smart's statement of this challenge as follows:

> If past, present, and future were real properties of events [i.e., properties possessed by physical events independently of being perceived], then it would require [non-trivial] explanation that an event which becomes present [i.e., qualifies as occurring *now*] in 1965 becomes present [now] at that date and not at some other (and this would have to be an explanation over and above the explanation of why an event of this sort occurred in 1965) (Grünbaum [1967]: 26-7).

Grünbaum then comments, "It would, of course, be a complete trivialization of the thesis of the mind-*in*dependence of becoming to reply that *by definition* an event occurring at a certain clock time *t* has the unanalyzable attribute of nowness at time *t*." (Grünbaum [1967]: 27). Tensed time theorists "have not even been able to hint how they might resolve that perplexity without utterly trivializing their thesis" (Grünbaum [1967]: 21).

Let us first try to clarify exactly what the perplexity is. In the antecedent of the conditional sentence cited by Grünbaum from Smart, past, present, and future are described as real properties of events. But the tensed time theorist would disagree with this characterization because on that theory there are no events which have the property of futurity. Indeed, only present events (or, better, things) exist, so that the antecedent should be revised to read: "If presentness (or nowness) is a real property of events, ..." How, then, is the consequent to be understood? What is it that is said to require explanation? Smart says, "that an event which becomes present in 1965 becomes present at that date and not at some other," and Grünbaum interprets this as "that an event which qualifies as occurring *now* in 1965 becomes now at that date and not at some other." Since "at that date" means "in 1965," the fact to be explained is why an event which becomes present or qualifies as occurring *now* in 1965 becomes present or now in 1965, rather than, say, 1966. But this fact appears to be a tautology--when

else could an event which is now in 1965 be now than in 1965? If this is not a tautology, then the fact requiring explanation must be something like the following:

4. An event, which *occurs* in 1965, is now in 1965, rather than in 1966.
   This fact is supposed to be something other than
5. An event, which *occurs* in 1965, *occurs* in 1965, rather than 1966.

The explanation of (5) would involve recounting the antecedent and contemporaneous causal conditions which exist earlier than and in 1965 and which are sufficient for the event's occurrence. But the explanation of (5) is not supposed to suffice for (4) because nowness is something over and above tenseless occurrence at a time *t*. Accordingly, the key conditional in the argument is:

6. If nowness is a real property of events, then there must be distinct explanations of why an event, which *occurs* in 1965, not only *occurs* in 1965 instead of 1966 but also has the property of nowness in 1965 rather than in 1966.

But how does it follow from the reality of the property of nowness that the explanations must be different? For it seems to be true that

7. Necessarily, if an event occurs at t_n, then that event has nowness at t_n.

Hence, if one has an explanation for why an event has tenseless occurrence at t_n, then that explanation coupled with (7) entails that the event has nowness at t_n. Grünbaum says that such a response trivializes the mind-independence of becoming. Not at all; Grünbaum conflates the property of "nowness" with the property of "nowness at a time". His confusion is again similar to that of those who conflate "actuality" with "actuality in a world." This confusion is already evident in Smart's statement, "Indeed, every event is 'now' at some time or another, and so the notion of 'now' cannot be that of an objective property in nature which singles out some events from others" (Smart [1963]: 135). It is correct that "nowness at a time" cannot single out one event from another, just as "actuality in a world" cannot distinguish a world; but it does not follow that "nowness" does not distinguish an event, nor actuality a state of affairs. So while it is trivial to state that an event which occurs at t_n has nowness at t_n, that does not impugn the significance of nowness. Hence, what is trivial is to ask why an event, which occurs at t_n, is now at t_n. For each event is now at the time at which it occurs, just as each state of affairs is actual in the world in which it obtains. We may conclude that the perplexity which Grünbaum alleges to attend the theory of tensed time is in fact no perplexity at all, but a mere triviality. Any explanation of why an event occurs at t_n will also suffice to explain why that event has nowness at t_n.

In sum, the arguments adduced by Grünbaum on behalf of the mind-dependence of temporal becoming are not in the end very impressive. Of course, that does not show that temporal becoming is not merely mind-dependent. But then it may be questioned whether the mind-dependence of becoming is even a coherent notion. In the first place, Grünbaum's own account of the mind-dependence of becoming seems to imply the reality of temporal becoming in the mental realm. Grünbaum explicates the notion of an event's occurring now in terms of its simultaneity with a

sentient subject's experiencing the event while being aware that he is experiencing the event. This characterization is, as Grünbaum came to realize, circular, since the verbs contained in this explication are present-tensed. But he dismissed the circularity as non-vicious because he claimed that he was not trying to provide a tenseless analysis of "nowness," but merely to articulate the mind-dependence of "nowness." But if the characterization is circular, how can it possibly articulate successfully the mind-dependence of becoming? On the contrary, by presupposing the objectivity of tense, does it not rather underline the fact that presentness is *not* mind-dependent? In order to articulate what it is for some event *e* to be present, Grünbaum has to presuppose that a sentient subject is experiencing (present-tense) *e*. If this is an objective matter of fact, then the presentness of *e* cannot be merely illusory. Thus, Grünbaum seems forced by his own account of what it is for an event to occur now to regard becoming as real in the mental realm, even if unreal in the physical realm.

Secondly, on the thesis of the mind-dependence of becoming there is at least the *appearance* of temporal becoming of the physical world. But the difficulty here, stated simply, is that the very illusion of becoming involves becoming. The German metaphysician Herrmann Lotze, contemplating whether the Principle of Identity entails the unreality of becoming, made this point when he remarked, "This consideration might lead us to repeat old attempts at a denial of all Becoming, or—since it cannot be denied--to undertake the self-contradictory task of explaining at least the becoming of the appearance of an unreal becoming" (Lotze [1887]: 1: 105). The position of the tenseless time theorist is reminiscent of Buddhist, Parmenidean, and Idealist denials of the reality of temporal becoming and their consigning becoming to the realm of appearance and illusion. The principal difference is that the tenseless time theorist insists that time is real, even though temporal becoming is not—to that extent these temporal illusionists were arguably more consistent than the tenseless time theorist. But never mind; the point remains that for the theorist of tenseless time as well as for atemporalist schools of philosophy, temporal becoming cannot be real either in the physical world or in the life of the mind but must somehow be wholly illusory. But then the defender of the mind-dependence of becoming labors under the same incoherence as all temporal illusionist theories, namely, that an illusion or appearance of becoming involves becoming, so that becoming cannot be mere illusion or appearance. A Buddhist philosopher can consistently deny the reality of space and spatial objects and hold these to be mere illusions of the mind, for an experience of spatiality does not entail spatiality, one's thoughts and perceptions not being spatial in nature. But an experience of temporal becoming, by contrast, itself involves a becoming of experiences. We can conceive of a person mistakenly accepting tenselessly and with no experience of becoming the putatively false proposition *Temporal becoming is real*, and such a one would be genuinely deceived about the reality of becoming. But such a person would not experience the illusion or appearance of becoming. We do. And therein lies the inescapable difficulty for the tenseless time theorist.

Thus, Grünbaum's attempt to turn back the force of the *kalām* cosmological argument by denying that the universe's beginning to exist implies that it came into being is no more successful than his malapropos attempt to show that the argument presupposed the spontaneity of nothingness.

Conclusion

Grünbaum's argument that various versions of the cosmological argument all presuppose the normalcy of nothingness is philosophically insensitive to the different versions of that argument employed by the likes of Aquinas, Leibniz, and al-Ghazali. While Thomas's version does make such a presupposition, Leibniz's more global argument for a metaphysically necessary being makes no such assumption and even denies it. Al-Ghazali's argument based on the finitude of the past similarly makes no assumption about the need for a *ratio essendi* of the world, nor was Grünbaum able to articulate any sense in which the assumption of the spontaneity of nothingness underlay his argument. Nonetheless, Grünbaum's efforts are not so much labor lost, for they profitably serve to focus the debate concerning the *kalām* argument on the question of the objectivity of temporal becoming and the tensed theory of time which it presupposes.

Notes

1 Grünbaum sees his critique as a challenge to the theological doctrine "that there must be a divine creative cause . . . for the very existence of the world" (Grünbaum [2000]: 1). As we shall see, Grünbaum is insensitive to important distinctions, and right at the outset it needs to be said that what Grünbaum is in fact challenging in this critique is not the *doctrine* of a divine creative cause (contrast [Grünbaum (1991): 234-6] where he does challenge this doctrine), but the *argument* from the very existence of the world to the necessity of a divine creative cause. The doctrine may be held on the basis of divine revelation in Scripture and should not therefore be thought of as "the theistic reply to the question "Why is there something, rather than just nothing?" (Grünbaum [2000]: 1).

2 Cosmologists often misleadingly press the difficulty posed by an absolute beginning in terms of the question, 'What was before the singularity?' In order to be acceptable this question must be construed in terms of causal, not temporal, priority.

3 Grünbaum also makes a number of subsidiary and polemical points, which are perhaps best dealt with in a footnote: (1) *Because, according to the standard model, past time is topologically open in the* earlier than *direction, having no first instant, the metrical finitude of the past does not imply that the universe began to exist except in a very special sense* (Grünbaum [2000]: 15). It is precisely the metric, not the topology, of time which is the determining factor in whether the universe began to exist. Time begins to exist if there is a non-zero, finite, temporal interval which is such that there are only a finite number of equal intervals earlier than it; or, alternatively, if there is some non-zero, finite, temporal interval which is such that there is no equal interval earlier than it. The reason Grünbaum treats the metric of time dismissively is because he is a conventionalist with respect to time's metric (Grünbaum [1973]: 8-18). But Grünbaum's conventionalism has been decisively refuted (Friedmann [1973]: 217-33; Horwich [1975]: ch. 3; Quinn [1976]: 396-414; Nerlich [1976]: 195-218), so that there is no reason to deny that the metric of time is an objective feature of reality. Thus, if the past is metrically finite, then time and the universe began to exist, regardless of whether a boundary instant existed or not. (2) *A universe with a metrically finite but topologically unbounded past*

does not require a cause of its origination because every state of the universe at any instantaneous time t *is caused by a prior state of the universe at* t′< t. Even if we concede the moot assumption that instants are the ontological constituents of time, the objection involves a *non sequitur,* apparently committing the fallacy of composition in inferring that because every instantaneous state of the universe can be causally accounted for, therefore the universe has been causally accounted for. The fact that every instantaneous state of the universe has a predecessor does nothing to explain why the universe exists if time and the universe began to exist. *Pace* Grünbaum, this is not to demand, with Leibniz and Clarke, a reason why the temporal series exists at all, even were it infinite, but to demand why the universe began to exist. That question is not answered by the affirmation that every instantaneous state in the finite past has a predecessor. (3) *Craig speaks of the universe beginning to exist by misdepicting the Big Bang singularity as a genuine first instant of time.* I have never so depicted the singularity; *au contraire* I have typically treated the initial cosmological singularity as a mathematical idealization, so that any initial interval of time is open in the *earlier than* direction (Craig and Smith [1993]: 43-4, 146-7, 224-7, 258-61). Indeed, in the place referred to by Grünbaum, I explicitly state that the singularity is neither an instant nor a moment of time, but a boundary of time (Craig [1994]: 222, n. 1). It is true that I have defined "begins to exist" in terms of something's first existing at a time *t* (Craig [1992]: 238), but here *t* stands in for moments, not instants, of time, as evident from my mention of "immediately prior" times, which can only refer to moments having non-zero duration. (4) *Craig declares an infinite past time to be logically impossible.* I have repeatedly said that my contention concerns metaphysical, not strictly logical possibility (Craig [1993]: 1-3).

4 Grünbaum makes the polemical point that since I did not in my previous critique give any hint as to how Thomas's view might be defended (Craig [1994c]: 247), presumably I have no response to Grünbaum's argument against Thomas's assumption of the spontaneity of nothingness (Grünbaum [2000]: 15). But I had and have no interest in defending the Thomistic cosmological argument; it is up to Grünbaum to explain why he rejects the Thomistic metaphysic which underlies the argument, which he has not even begun to do.

5 Indeed, if physical processes do not suffice to render time anisotropic, then on a tenseless theory one cannot say that the universe began to exist in any sense; see below, pp.

6 N.B. that since *t* can represent moments (non-zero, finite temporal intervals) as well as instants of time, the explication offered here is applicable to a universe which is metrically finite yet topologically open in the past. Such a universe could be said to begin at any arbitrarily specified first moment of time.

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Part Two

The Universe Began to Exist

3

Must Metaphysical Time Have a Beginning?

Wes Morriston

Proponents of the *kalām* cosmological argument[1] seek to establish, not only that the beginning of the universe has a cause, but also that the cause of this beginning is a *first* cause – one not caused by any prior cause. It is therefore important to their overall project to establish that the series of events (if any) leading up to the creation of the universe also has a beginning.

This may seem unnecessary. *Time,* it may be said, came into existence along with the physical universe, so that it is not even *meaningful* "to ask what happened before the big bang."[2] It is far from clear, however, that this is the right way to look at things.

To see this, suppose that the big bang was caused by a personal agent who did some other things first. To borrow an example from William Lane Craig, the Creator could have done a sort of "count down" to creation: *Five, four, three, two, one, Let there be light!*[3] Had he done so, there would have been a temporal series of distinct mental events leading up to the creation of the physical universe.

Craig has called this a "knockdown argument" for the conclusion that "time as it plays a role in physics is at best a measure of time rather than constitutive or definitive of time."[4] He believes that time itself – or metaphysical time, as he calls it – is tensed, dynamic, and non-relative. On this view of time, there is an ever changing fact of the matter about which events are future, which present, and which past. Future events become present, present events become past, and past events sink ever further into the past.

We have just seen that a series of mental events succeeding one another in this kind of time is at least conceivable independently of the existence of our universe. But there also does not seem to be any a priori bar to the possibility of a temporal series of *non*-mental events occurring prior to the beginning of our space-time. If he had wanted to, God could have created a whole series of universes, each with its own history and its own special laws, prior to creating ours. Alternatively, one universe might have arisen from the ruins of a previous one without any special divine intervention. We may not have an adequate *theory* to explain how this could have happened, but it is one of the logical possibilities.[5]

This might seem to leave open the further possibility that the cause of our universe is only the most recent in an infinite temporal series of causes and effects. However, most proponents of the *kalām* cosmological argument believe that this can be ruled

out on purely a priori grounds. Craig, for example, deploys two distinct philosophical arguments for saying that time (and not just the universe) must have a beginning.

According to the first of these arguments, an infinite series of past events is impossible because no actually infinite set of objects can be instantiated in reality. According to the second argument, an infinite series of past events would be impossible whether or not an actually infinite set of simultaneously existing objects could be instantiated in reality. The reason given is that no infinite series formed by "successive addition" can be completed.

Unfortunately, I believe that neither of these philosophical arguments is successful. In the next two sections, I take aim at the successive addition argument. The remainder of the paper will be devoted to Craig's argument against the possibility of an actual infinite.

The successive addition argument

Craig summarizes the successive addition argument as follows.

1. The temporal series of past events is a collection formed by successive addition.
2. A collection formed by successive addition cannot be actually infinite.
3. Therefore, the temporal series of past events cannot be actually infinite.[6]

On a dynamic theory of time, premise 1 seems straightforward enough. It says that the events in the series of past events have happened successively, one after the other. Each event has become past, followed by another which also became past, up until the present.

But what about premise 2? Why can't a collection formed in this step-by-step way have infinitely many members? Craig's answer is that an infinite collection can never be completed. No matter how many members are added to the collection, one could always add another. So no matter how many are added, the number of elements in the collection is necessarily finite. Infinity never arrives.

This is obviously how it is with any series *having a temporal beginning*. Consider, for example, the series of years that began on January 1, 1901. One hundred of its member years have passed by. The hundred and third is nearly completed. But no matter how many years are added, only finitely many years will have been added to this series. The series of years beginning on January 1, 1901 will never be a *completed infinity.*

But what about a series *having no temporal beginning*? Why couldn't there have been an infinite series of years in which there was no first year? It's true that in such a series we never "arrive" at infinity, but surely that is only because infinity is, so to speak, "always already there." At *every* point in such a series, infinitely many years have *already* passed by. Where, it may be asked, does Craig think he has shown that an infinite series of past events must *arrive* at infinity?

It might be thought that this objection overlooks the reality of temporal becoming. If a series of events is formed by the successive addition of one event after another, how

can it fail to have a first member? I answer: Whether this conclusion follows depends on what is meant by saying that a series is *formed by successive addition.* If this is only a way of saying that each event in the series is added to the earlier ones (if any) until the series is complete, then it is certainly true that the series of past events is formed by successive addition. But from this alone it does *not* follow that there is a first event in the series. Each event in a *beginningless* series terminating in the present could have been "added" to the infinitely many prior events. (If you have a problem with this, it is probably because you have a more general problem with the actual infinite. More on this below.)

I fear that what defenders of the *kalām* argument really mean when they say that any temporal series must be *formed by successive addition* is something like this: *Beginning with the first event in the series,* events are successively added until the series is complete. But now premise 1 of the argument is the problematic premise. It is utterly question-begging to assume that *every* series of events must have been formed *starting* with a first event. Certainly, nothing like that follows from a dynamic theory of time.

However, Craig denies that his argument makes this question-begging assumption. "The fact that there is no beginning at all, not even an infinitely distant one," he says, "makes the difficulty worse, not better."[7] And he joins G. J. Whitrow in urging that the question of how an infinite sequence of events "could actually be produced" has been "ignored."[8]

But surely it is Craig who has not properly faced up to the question how a beginningless sequence of past events would be "produced." He supposes that it would have to be by "successive addition." But can he explain what he means by "successive addition" in such a way as to make premise 2 of his argument true? Can he do so without presupposing that the series of past events must have a beginning? I see no reason to believe that he can.

An incautious reasoner might be tempted to suppose that since the past is composed of events that have "passed away" – beginning, enduring, and coming to an end – the past *as a whole* must have "passed away" in this same sense. But when we are thinking clearly, and do not fall into a fallacy of composition, we see that this does not follow *unless* it is also assumed that the past has a beginning. And that, let us not forget, is the very point at issue.

I conclude that a dynamic theory of time does not by itself commit us to the view that "formation by successive addition" entails "formation *from* a starting point" Consequently, we have no reason to accept premise 2 of the successive addition argument.

Why didn't it all happen earlier?

So far, I have been defending the possibility that infinity is "always already there" – that at every point in the series of past events, infinitely many others have already passed by. Craig attacks this suggestion directly. "If the universe did not begin to exist a finite time

ago," he says, "then the present moment could never arrive."[9] He explains and defends this claim by way of the following imaginary example:

> . . . suppose we meet a man who claims to have been counting from eternity, and now he is finishing: −5, −4, −3, −2, −1, 0. Now this is impossible. For, we may ask, why didn't he finish counting yesterday or the day before or the year before? By then an infinity of time had already elapsed, so that he should have finished. The fact is, we could never find anyone completing such a task because at any previous point he would have already finished.[10]

I do not think this is a good argument. It confuses "having counted infinitely many negative numbers" with "having counted all the negative numbers up to zero." The man in Craig's example has indeed always already completed the first of these tasks; but he has not completed the second one until he arrives at zero. When he arrived at −1 he completed a different task – that of counting all the members in the series < .., −n, .., −2, −1 >. When he arrived at −2, he completed yet another task – that of counting all the members in the series, < .., −n, .., −3, −2 >. And so on.

Craig has tried to answer this obvious objection. In order to show that an infinite count could have been completed, he thinks his opponent must appeal to the Principle of Correspondence, according to which two sets have the same number of members if they can be placed in one-to-one correspondence.

> On the basis of this principle the objector argues that since the counter has lived, say, an infinite number of years and since the set of past years can be put into a one-to-one correspondence with the set of negative numbers, it follows that by counting one number a year an eternal counter would complete a countdown of the negative numbers by the present year.[11]

Notice how deftly Craig shifts the burden of proof to his opponent here. The objector may not have intended to give an argument *for* saying that a beginningless count *is* genuinely possible. He may merely have been asking Craig to show that it is *not* possible, and pointing out that he has not done so until he has excluded a certain *apparent* possibility.

But let that pass. Having attributed this argument for the infinite past to his opponent, Craig presses home his own point. Why, he asks, wouldn't the counter finish "next year or in a hundred years?" He supposes that the only reply available to his opponent is to say that "prior to the present year an infinite number of years will have already elapsed, so that by the Principle of Correspondence, all the numbers should have been counted by now." Since this is precisely the reasoning the opponent objected to when he accused Craig of confusing counting *infinitely many* numbers with counting *all* the numbers, Craig concludes that the objection "backfires" on his opponent.[12]

This dialectical maneuver of Craig's is puzzling, to say the least. If his opponent were to respond in the way suggested, then he would have made the same mistake as Craig. But it doesn't follow that it is not a mistake or that Craig has not made it.

Craig apparently thinks that this is what his opponent *must* say. But in this he is surely mistaken. The proper response to the question why the counter wouldn't finish "next year or in a hundred years" is *not* to say, "Because infinitely many numbers *can* already have been counted by now." It is rather to turn the question back at Craig, and ask why the count should *not* be ending now. Why *should* it end later than now? No doubt there *could* have been a beginningless count ending in zero "next year or in a hundred years." But it does not follow that there cannot *also* be one terminating in the present. Certainly, Craig cannot show that a count ending in zero now is *not* possible merely by arguing that one ending in zero next year would *also* be possible.

To put the point a bit differently, why is this even a question that Craig's opponent needs to answer? Why does the opponent need to explain why the counter finished today rather than some other day? Why isn't enough to say, "That's how we imagined the case?"

It may be thought, however, that I have not properly appreciated the main thrust of Craig's argument. Although he doesn't spell it out clearly, perhaps the argument he really has in mind goes something like this. If a beginningless count were possible, there would *have to be* some reason why the counter finishes when he does. Since no such reason *can* be given, it follows that a beginningless count is not possible.[13]

Let's try to state the proposed argument a bit more carefully. When Craig asks, "Why didn't he finish counting yesterday (or tomorrow)?" he is asking:

> (CQ) Why is *the whole series* of "counting events" leading up to "zero" located at the beginningless series of temporal positions that terminates in the present, rather than at the beginningless series of temporal positions that terminated yesterday (or tomorrow)?

And the reason this question seems so compelling to him is that he is implicitly committed to something like the following argument:

1. If a beginningless count is possible, then there *must* be an answer to CQ – i.e., there must be a *reason why* the whole series of counting events is located at the series of temporal locations that terminates in the present.
2. No such reason *can* be given.
3. Therefore, a beginningless count ending in zero is not possible.

Does this argument succeed in establishing the impossibility of a beginningless count? The first thing to see is that if we are to make sense of CQ (and premise 1), we must suppose that there are two distinct series – a series of past *counting events* and a series of past *times.* For convenience, let's suppose that the past is divided into segments of equal length and that each past event occupies one and only one of these segments of duration. Assuming that the series of past events is infinite, we can represent the two series as follows:

$$\begin{array}{ll} \text{ES} & < \ldots E_{-n} \ldots E_{-2}, E_{-1}, E_0 > \\ \text{TS} & < \ldots T_{-n} \ldots T_{-2}, T_{-1}, T_0 > \end{array}$$

Then what CQ amounts to is this: "Why do the events in ES map onto the chunks of duration in TS in the way that they do?" Since both series are beginningless, it could just as easily have been the case that E_0 happened at T_{-1}, E_{-1} at T_{-2}, and so on. So why does the series of events terminate at T_0 rather than at T_{-1} or at some earlier time? Why, for example, aren't they correlated in the following way?

$$\begin{array}{ll} \text{ES} & < \ldots E_{-n} \ldots E_{-2}, E_{-1}, E_0 > \\ \text{TS} & < \ldots T_{-n} \ldots T_{-2}, T_{-1}, T_0 > \end{array}$$

Now it is not immediately obvious that there *must* be an answer to CQ, or that the *possibility* of a beginningless count depends on the possibility of an answer to this question. Why couldn't it be a brute contingent fact that ES maps onto TS in the way that it does? Why couldn't CQ be one of those big questions that simply cannot be answered? Why couldn't it have a status comparable to that of other "stumpers" such as: Why is there anything at all? Or: Why *these* laws of nature?

To suppose that questions like these *must* have answers is implicitly to assume that something like Leibniz's Principle of Sufficient Reason is a necessary truth. Is it possible that Craig wants to rest his case on this highly controversial principle? That he assumes without discussion or argument that brute contingency is impossible? One wouldn't have thought so. After all, one of the strengths claimed for the *kalām* argument is that it makes do with the weaker (and more widely accepted) principle that whatever begins to exist must have a cause.[14]

But let that pass. Suppose, at least for the sake of argument, that if a beginningless count is possible then there must be an answer to CQ. Why should we also think that no answer is possible? Maybe the reason why the counting events in ES map onto the segments of duration in TS in the way that they do is that there is *another* beginningless series of events – call it ES^* – such that the events in ES^* are responsible for the ones in ES and such that the events in ES^* map onto the segments in TS in that way? For example, there might be an eternal demon who has – always – been making the man count.

The possibility of this sort of answer to CQ won't get us very far, however. Not because it is logically impossible, but because it merely puts off the problem. The real underlying question is why the history of "reality" (including *all* the events that have ever happened at any time – whether within or without the physical universe) did not reach its present *state* prior to the present *time*. Why not a year ago? Or two years ago?

So let us deepen our example, this time letting ES stand, not for a series of particular acts of counting, but rather for a series of past "macro-events," each of which includes *everything* that was going on at the time of that event We can then think of these macro-events as a series of "temporal slices" of the history of "reality." And Craig's question would be – Why wasn't the whole series of temporal slices completed at an earlier time? Why wasn't *the whole infinite series of macro-events* leading up to the present one completed at T_{-1} or at T_{-2} or at some yet earlier time? Given the Principle of Sufficient Reason, there *must* be an answer. But assuming that the segments of time in TS are intrinsically indistinguishable from one another, it appears that no answer is possible.

How strong is this argument? On thing is clear. The argument won't go through unless we are entitled to think of the series of temporal segments in TS as being independent of the series of events in ES. This seems wrong to me. As far as I can see, the flow of (dynamic) time just *is* the continual happening of events, and the past just *is* the series of events that have already happened.[15] From this standpoint, there is no more mystery about the answer to the question, "Why does the series of *events* end at this time rather than some other?" than there is about the question, "Why does the series of *times* end with this time rather than some other?"

Someone might be tempted to reply that TS is independent of ES only in the sense in which a metric can be independent of something it is supposed to measure. But this will hardly serve the needs of the present argument. If TS is no more than a metric for ordering and measuring the succession of events in ES, the proper answer to the question, "Why does E_0 happen at T_0 rather than at T_{-1}?" will be nothing more exciting than, "Because that's how we applied our chosen metric to the series of events."

A simple analogy will make this clear. Suppose that we have a bolt of cloth, and a measuring stick, calibrated in inches, that we want to use to measure a ten inch swatch of cloth. Obviously, we can line up the end of the cloth with the end of the measuring stick, or we can line it up with the one inch marker on the measuring stick, or with the two inch marker, and so on. It's completely arbitrary which we decide to do. As long as we can do simple subtraction, we'll have no trouble measuring out a ten inch swatch of cloth. Now suppose someone asks, "Why is the edge of the stick lined up with the end of the cloth? Why not the one inch mark?" This is hardly a question that "cries out" for a "sufficient reason" type answer.[16]

The lesson is clear. In order to motivate the question, "Why T_0 and not T_{-1}?" the series of temporal segments in TS needs to be real and independent of the series of events in ES. It cannot be a mere metric, and its reality cannot consist wholly in the continual happening of the events in ES. But it is far from obvious that this is the right way to think about time. Indeed, the argument under consideration could be viewed, *not* as a reason for thinking that the series of events must have a beginning, but rather as a reason for not adopting a substantivalist theory of time.[17]

I conclude that the argument under consideration stands or falls with two highly controversial assumptions – (i) that the series of times at which the whose series of events occur is ontologically independent of those events,[18] and (ii) that something like the principle of sufficient reason would be applicable to the global correspondence between an infinite series of events and the series of times at which they occur.[19]

Hilbert's Hotel

Let's turn next to the other main philosophical argument against the possibility of a beginningless past. If the series of past events had no beginning, then the set of past events would be an actual infinite. But Craig thinks that the instantiation of an actual infinite in the real world would bring with it a number of implications sufficiently absurd to warrant the conclusion that no such set is possible. If this is right, it follows

that the set of all past events is not actually infinite, in which case there must be a first event in the series of past events.

One of Craig's favorite illustrations of the absurdity of an actual infinite is "Hilbert's Hotel" – the famous imaginary hotel in which infinitely many guests occupy infinitely many rooms. The hotel has no vacancies, and yet space can always be found for new guests merely by cleverly reassigning the old guests to different rooms. No one has to leave the hotel to make room for the new guests. Craig thinks this is absurd – no matter how large the hotel, if it is full, one cannot create vacancies merely by moving the guests into different rooms.

Many philosophers would argue that the "absurdity" of Hilbert's Hotel is more apparent than real – that one shouldn't expect an infinite set to behave like a finite one. But others do seem to find the properties of an infinite hotel more than merely "weird." They are inclined to agree with Craig that such a thing could not exist in any possible world. I am not at all sure that they are right about this, but for the sake of argument, let us provisionally assume that Hilbert's Hotel really is impossible, on the ground that, no matter what the size of the hotel, it really is absurd to suppose that one could *create new vacancies merely by moving the guests to different rooms.* For ease of exposition, let's call this the *Absurd Implication.* How, exactly, is it supposed to follow that the series of past events could not be actually infinite? Craig explains:

> The actual infinite *entails,* that is, necessarily implies, that such absurdities could exist. Hilbert's illustration merely serves to bring out in a practical and vivid way what the mathematics necessarily implies; for if an actually infinite number of things is possible, then a hotel with an actually infinite number of rooms must be possible. Hence, it logically follows that if such a hotel is impossible, then so is the real existence of an actual infinite.[20]

Craig's reasoning may conveniently be outlined as follows:

1. Hilbert's Hotel is not possible. (On account of the Absurd Implication.)
2. If Hilbert's Hotel is not possible, then no actually infinite set is possible.
3. Therefore no actually infinite set is possible. (from 1 and 2)
   And since
4. An infinite series of past events would be an actual infinite.
   it also follows that
5. An infinite series of past events is not possible. (from 3 and 4)

We are assuming, for the sake of argument, that premise 1 is true. I have no quarrel with premise 4. But what about premise 2? Can we *generalize* the impossibility of a hotel with infinitely many rooms to *all* sets with infinitely many members?

It's not at all obvious that we can. Before leaping to the conclusion that infinite sets are impossible *in general,* we need to ask what it is in the example that generates the Absurd Implication and whether some analogous feature is present in all infinite sets.[21] In the case before us, I think the Absurd Implication follows from the way in which *infinity* interacts with other features of the example. A hotel is a collection of *co-existent*

objects (rooms and guests) whose physical relationship to one another can be *changed*. It is only when these features are *combined* with the property of having infinitely many rooms and guests, that one can draw the Absurd Implication. If the rooms and guests did not exist simultaneously, the idea of the hotel's being "full" would lose all meaning. If it were metaphysically impossible to change the physical relationship between guests and rooms – if the guests were not the sort of thing that could be moved from one room to another, then they would exist immutably in their immutable rooms, and the Absurd Implication would again not follow.

What, then, does the "absurdity" of Hilbert's Hotel entitle us to conclude about the actual infinite? Not, I think, that no set of real objects could be actually infinite, but at most that there cannot be an actually infinite set *of a certain sort* – one whose elements are *co-existing* objects bearing a *changeable physical relationship* to one another. It is only when these features are taken together – as they are when we postulate infinitely many guests in a changeable relationship to the infinitely many rooms they occupy – that we get the Absurd Implication.

The "absurdity" of Hilbert's Hotel cannot therefore be generalized to *all* infinite sets. For example, it does not follow from the special impossibility of Hilbert's Hotel that there could not be infinite sets of numbers or other abstract entities. Craig, of course, denies that abstract entities exist "in reality." But he cannot show that he is right about this merely by pointing out that one cannot create vacancies in a hotel by moving the guests around. A Platonist about numbers is not committed to thinking that one can move the other numbers around so as to make "room" for a new one that one has just been "created." Numbers are simply not the sort of thing that can be shuffled around or created or changed in any other way.

More importantly for our purposes, there is no Hilbert's Hotel problem for an infinite series of past events. A temporal series of past events cannot be changed or "manipulated" in such a way as to produce paradoxes analogous to those of Hilbert's Hotel. There is no sense whatever in the idea of shifting the events of the year 1939 to 1938, the events of 1938 to 1937, and so on, to "make room" for some other set of events that one wants to slip into the year 1939. And this is so *whether or not* the past has a beginning. The special impossibility of an infinite hotel (assuming still that it really is impossible) does not therefore entail that an infinite series of past events is impossible.

However, the following objection has been suggested to me.[22] Assuming (as Craig does) a dynamic theory of time, there is a sense in which the position of each past event in the temporal series is continually changing. Each past event sinks further and further into the past as new events become present and then past. But if the past is infinite, then (so the objection goes) every possible temporal location in the past is *already occupied* by a past event. Where, then, are present and future events supposed to go when they become past?

Do we now have a Hilbert's Hotel problem for the infinite past? I don't think so. It is true, of course, that on a dynamic theory of time, past events change their temporal location *in relation to the present*. And it also no doubt true that every one of the infinitely many past temporal locations is occupied by a past event. (If, as I suggested in section

II, the passage of time just *is* the happening of events, then *of course* each temporal location will be occupied by some event or other.[23]) But why suppose that the past already contains all *possible* past times? Why not simply say that new temporal locations are continually *added* to the past to accommodate new events as they become past?

If we insist on comparing the series of past times to a hotel, we should compare it to an infinite hotel in which there is always room for new guests – not because the old guests are moved out of one room and into another – but because new rooms can be added to accommodate them. Nothing like the Absurd Implication follows from such a scenario.[24]

But perhaps the objector is thinking along the following lines. Suppose the temporal positions in the infinite past are numbered sequentially, one location for each negative number up to −1. Then all the negative numbers (and the corresponding temporal locations) are "taken" and none of them is available for the newly past event. Obviously enough, a new negative number cannot be created to accommodate the newly past event. Does it not follow that all possible locations are already occupied by the infinitely many past events?

No, it does not follow. The series of negative numbers functions here only as a set of *labels* for the series of temporal positions. No matter how many distinct temporal locations are added to the infinite past, one can always re-label them in such a way that they are placed in a (different) one-one-one correspondence with the negative numbers. Such a re-labeling obviously does not entail kicking events out of their previously held temporal locations. If we bother with labels at all, every past moment continually gets a new numerical "label" corresponding to its distance from the present. But that is not at all like physically moving guests from one set of rooms to another, and nothing like the Absurd Implication rears its ugly head.

As it happens, however, Craig has argued that such a re-labeling of the elements in an infinite set is impossible. He considers a similar suggestion in connection with another of his examples – the infinite library in which the books are numbered from zero onwards. Craig had argued that no books could be added to such a library, since all the numbers are already "taken," and Quentin Smith replied that the books might simply be re-numbered. Craig's reply is that this would violate "the initial conditions laid down in the argument", according to which we are to imagine "a series of consecutively numbered books beginning at 0 and increasing infinitely, not a series of books numbered from some finite number." "Once the objects are numbered as stipulated", Craig says, "reassigning the numbers to begin with the proposed addition seems *impossible.*"[25]

I do not find this argument of Craig's at all convincing. Neither in the case of the infinite library nor in that of an infinite series of past events are we violating "the initial conditions" of the example. The "initial condition" in the library case is that the books are numbered from zero onwards, not that the numerals on the spines of the books are *immutably* attached to just those books. And the proposed "initial condition" in the case of the infinite series of past events is that they are correlated with the negative numbers – not that this particular correlation stays immutably the same. It is perfectly consistent with the example as I have described it to say that the way in which past events are correlated with the negative numbers is subject to continual change.

I think we may safely conclude that the special peculiarity of Hilbert's Hotel cannot be duplicated for an infinite series of past events. The Absurd Implication follows from Hilbert's Hotel *only* because of the way in which it *combines* the *infinite number* of rooms (and guests) with other features of the example. What has been "reduced to absurdity", therefore, is not the possibility of an actual infinite, but at most the *combination* of the actual infinite with these other features. Infinite sets that do not possess these features – such as an infinite series of past events – are not shown to be impossible by this Absurd Implication.

It is true, of course, that *any* infinite set (including Hilbert's Hotel) will have *other* implications that Craig believes to be absurd. The number of elements in the set of natural numbers is no greater than the number of odd numbers. So if the rooms in an infinite hotel are numbered from 1 onwards, then the total number of rooms is not greater than the total number of odd-numbered rooms. Similar things could be said about an infinite series of events or chunks of temporal duration. For example, if infinitely many hours have gone by, then the number of minutes that have passed is not greater than the number of hours (or days or weeks or months or years) that have passed by. And if that is absurd, then metaphysical time must have a beginning.

But all the rest of the window-dressing – all the talk about moving infinitely many guests from one room to another in an infinite hotel – is a distraction from the main issue. Even if these consequences of an infinite hotel are genuinely absurd, they cannot be generalized to *all* infinite sets in such a way as to show that an actually infinite series of past events is impossible.

Euclid's maxim about wholes and parts

So let's restrict ourselves to properties that are shared by all infinite sets. Would these properties lead to absurdity if they were instantiated in the real world? Craig thinks so. Since, as all must agree, the number of elements in any infinite set is *not greater than* the number of elements in infinitely many of its proper subsets, Craig thinks that *all* infinite sets necessarily violate a principle he refers to as "Euclid's Maxim."

EM A whole is greater than any of its parts.[26]

And since he believes that EM must be true of any set instantiated in the "real world," he concludes that there can be no infinite sets in the real world. If Craig is right about this, we have a completely general argument – one that, if sound, could be deployed even against an infinite series of events. But is he right?

The first thing to see is that Euclid's maxim about wholes and parts says nothing about the *number* of elements in a set. At most, it entails that *taken as a whole,* a set is *greater* than a mere *part* (a proper subset) of itself. This is important, because Craig's argument turns on the claim that an infinite set would *not* be "greater" than some of its parts, and because (as we are about to see) there is a perfectly straightforward sense

in which an infinite set is greater than any of its proper subsets, even those having infinitely many members.

The example of an infinite hotel makes this clear. There is an obvious sense in which Hilbert's Hotel is "greater" than any of its parts, and this is so even though it does not have a greater *number* of rooms than some of them have. For instance, the hotel as a whole is "greater" ("larger") than the part of the hotel containing only rooms numbered 3 and higher *simply in virtue of the fact that it contains rooms numbered 0, 1, and 2 as well as all the higher numbered rooms.* This is all by itself a perfectly legitimate sense of the word "greater" – one that is logically independent of the question, "What is the *number* of rooms in the two sets?" In this sense, *any* set – even an infinite one – is "greater" than any of its parts. When the word "greater" is understood in this way, Hilbert's Hotel does *not* violate EM.

Euclid's Maxim, then, is not sufficient to get Craig's argument off the ground. His argument requires a principle that refers explicitly to the *number* of elements in a set Something like the following would do the trick

CM A set must have a greater *number* of elements than any of its proper subsets.[27]

But is CM true of all sets that might be instantiated in the real world? Everyone would agree that while it is true of all finite sets, it cannot be true of infinite sets (if there are any). But what should we conclude from this? That there can't be any infinite sets? Or merely that CM is true of finite sets, but not of *all* sets?

You might think Craig could break the impasse by exhibiting the various "absurdities" that would follow from the instantiation of infinite sets in the real world. But as we have seen, the "absurdity" of Hilbert's Hotel follows only when infinity is combined with other features of the example that do not apply to all infinite sets. And as far as I can see, the other supposed "absurdities" Craig finds in infinite sets will be deemed "absurd" only by those who are *already* committed to something like CM. If you don't already think CM is true for *all* sets, you have no reason to think it "absurd" to suppose that the number of rooms in an infinite hotel is not greater than the number of rooms in some of its proper parts, or that the number of minutes is not greater than the number of hours in a beginning-less past. Craig's examples doubtless bring out "anti-infinitist" intuitions in some people, but they do not settle the issue for the rest of us.

What is infinity minus infinity?

However, Craig insists that his argument against the actual infinite does not rest on Euclid's Maxim alone.

> . . . not all the absurdities stem from infinite set theory's denial of Euclid's axiom: the absurdities illustrated by guests checking out of the hotel stem from the self-contradictory results when the inverse operations of subtraction or division are

> performed using transfinite numbers. Here the case against an actually infinite collection of things becomes decisive.[28]

What are these "self-contradictory answers?" They are the answers we get when we try to "subtract infinity from infinity." Here is one of Craig's explanations:

> Suppose the guests in room numbers 1, 3, 5, . . . check out. In this case an infinite number of people have left the hotel, but according to the mathematicians there are no less people in the hotel—but don't talk to that laundry woman! . . . But suppose instead the persons in room number 4, 5, 6, … checked out. At a single stroke the hotel would be virtually emptied, the guest register reduced to three names, and the infinite converted to finitude. And yet it would remain true that the *same number* of guests checked out this time as when the guests in room numbers 1, 3, 5, . . . checked out.[29]

It is not immediately clear that there is any "contradiction" here that we need to worry about.[30] The supposed difficulty arises only if it is assumed that inverse arithmetical operations can be performed on the number of elements in any set that can be instantiated in the "real world." But why should we agree to operate on that assumption? In *Theism, Atheism, and Big Bang Cosmology,* Craig explains why he thinks so in terms of another of his examples – an imaginary infinite library.

> While we may correct the mathematician who attempts inverse operations with transfinite numbers, we cannot in the real world prevent people from checking out what books they please from our library.[31]

Craig's argument here is that since books can be checked out of any library in the "real world," inverse operations must be capable of being performed on the number of books in the library. Presumably Craig would give a similar argument for hotels. Since guests can check out of any hotel, inverse operations can always be performed on the number of guests.

Craig apparently assumes that a parallel argument is available for any set that could be instantiated in the "real world." If so, he is mistaken. The argument implicitly appeals to features of the infinite library (or the infinite hotel) that are *not* possessed by just any infinite set – and in particular are *not possessed by an infinite series of past events.* Whether or not the past is infinite, one cannot "remove" an event from the past. What has happened cannot (now) not have happened. So this particular motive for thinking that arithmetical subtraction must be possible does not apply to the case we are principally interested in.

But even as applied to infinite libraries and hotels the argument is a *non sequitur.* From the fact that $(\aleph_0 - \aleph_0)$ is undefined it does not follow that one cannot check books out of the imaginary library or that guests cannot leave Hilbert's Hotel. What follows is only that, depending on which books are removed, the *number* of volumes present in the library (or guests in the hotel) may or may not be smaller after their

removal. That is indeed a characteristic of any actually infinite set, but it is hardly a 'logical contradiction." And it is unlikely to bother anyone who is not already committed to CM.[32]

The Infinite Future

If there were a genuine contradiction here, this would have exceedingly unwelcome consequences for those who, like Craig, believe in the life eternal. By way of illustration, suppose that some created spirit will be saying "hallelujah" on a regular basis forever. Then infinitely many hallelujahs will be said in heaven. No matter how many have been said, infinitely many remain. (In the words of a much loved hymn, "When we've been there ten thousand years, bright shining as the sun, we've no less days to sing God's praise than when we first begun.") Now "subtract" every other hallelujah. The "remainder" is infinite. Next "subtract" all those that will be said after January 1, 2100. The "remainder" is finite. And yet the number of hallelujahs subtracted in each case is the same!

Craig would presumably grant that no matter how many hallelujahs *have been* said, another *will be* said. But he would insist there is no future time at which infinitely many of them *have* been said. The series of future hallelujahs is only *potentially* infinite. It is not therefore an infinite of the sort that he has a problem with.

Unfortunately, things are not this simple. While it is true that there will be no time at which infinitely many hallelujahs *have been* said, the fact remains that infinitely many *will be* said. This endless series of future hallelujahs can be placed in one-to-one correspondence to the series of natural numbers. Why isn't that sufficient to make the series of hallelujahs an actual infinite of just the sort the Craig finds so objectionable?

It is fairly clear how Craig would answer this objection. An event, he says, is "that which happens."[33] He holds that future events *do not exist,* since they are not (yet) happening. Consequently, Craig believes that there is no set of actually existing future events. That is why he thinks a series of future events cannot be an actual infinite.

But how, one may ask, is that supposed to make the future different from the past? Future events are *not yet* happening. But it is equally true that past events are *no longer* happening. Should we then conclude that past events no longer exist, and that a beginningless series of past events would not be an *actual* infinite? No. Craig insists that past events do exist. Here is his explanation.

> Since past events, as determinate parts of reality, are definite and distinct and can be numbered, they can be conceptually collected into a totality. Therefore, if the temporal sequence of events is infinite, the set of all past events will be an actual infinite.[34]

But surely, one might reply, the future hallelujahs in our example are also "definite" and "distinct" and can be "numbered." If not by us, then by God. So how is this supposed to make the past different from the future?

I suppose someone might argue that the *particular* future hallelujahs in the sequence of future events cannot even be referred to, in which case they obviously could not be "conceptually collected into a totality." Is this at all plausible?

As far as I can see, there is only one way to make sense of this suggestion. If the future, unlike the past, were at least partly *indeterminate,* i.e., if there were genuine truth value gaps for at least some future tense propositions, then it would be open to Craig to hold that there is not a complete and determinate set of truths about each future hallelujah – in which case he might perhaps have some basis for arguing that we cannot refer to them, or treat them as future particulars that could be "conceptually collected into a totality."

This move is not available to Craig, however, since he believes that God has complete and infallible foreknowledge of the future. Indeed, he explicitly denies that there are truth value gaps for any future tense propositions, thereby committing himself to the view that there is – always – a complete body of truth about the future. It is therefore very hard to see how the endless series of future events is supposed to be *relevantly* different from a beginningless series of past events. If the latter can be "conceptually collected," so can the former. If we can speak meaningfully about particular future events, and formulate true propositions about them, then there is no reason at all why we cannot distinguish them from one another and number them. Since (as Craig agrees) there is no last member of the series of future events, they can be placed in one-to-one correlation with the series of natural numbers. And if that is sufficient to make an actual infinite out of a beginningless series of events that have happened, then it must surely do the same for the endless series of events that will happen. Given that there is a complete body of truth about the future, we must conclude *either* that the future is not endless *or* that it is an actual infinite.

Conclusion

I have tried to show that neither of Craig's philosophical arguments against the possibility of an infinite past is successful. This is important because it leaves open the possibility that the beginning of our universe was caused by the most recent in an infinite series of dependent causes. The *kalām* argument does not, then, provide a conclusive proof of a *first* cause.[35]

On the other hand, the *kalām* argument does force us to ask hard questions – Why did our universe come into existence? Where did it come from? – to which theists may believe they have a very good answer. Even if the conclusions of this paper are correct, it might still be the case that creation *ex nihilo* by a personal God is more *likely* than a beginningless series of dependent causes. How much (if any) more likely – and whether it is likely *enough* to warrant belief in God – are questions that must be left for another occasion.[36]

Notes

1 The term is derived from the phrase *kalām Allah* (Arabic for "word of God"). The *kalām* cosmological argument is so called in recognition of its advocacy by Muslim philosophers in the eighth to the tenth centuries. In our time, it has been stoutly defended by William Lane Craig, among others. The core argument has two premises and a conclusion. (1) Whatever begins to exist must have a cause. (2) The universe began to exist. Therefore (3) the universe has a cause.

2 J. Richard Gott III, James E. Gunn, David N. Schramm, Beatrice M. Tinsley, "Will the Universe Expand Forever?," *Scientific American,* March 1976, p. 65. Quoted by William Lane Craig in "Philosophical and Scientific Pointers to Creation *ex nihilo*", R. Douglas Geivett and Brendan Sweetman, eds. *Contemporary Perspectives on Religious Epistemology* (New York and Oxford: Oxford University Press, 1992), 185-200.

3 Adapted from William Lane Craig, "The Origin and Creation of the Universe: A Response to Adolf Grünbaum", *British Journal for the Philosophy of Science* 43 (1992), 233-240.

4 William Lane Craig, "Design and the Cosmological Argument", in *Mere Creation: Science, Faith and Intelligent Design,* ed. By William A. Dembski (Downers Grove, Ill.: InterVarsity Press, 1998), 350-1.

5 Craig sometimes argues against such possibilities on *empirical* grounds. For example, he claims that the most recent scientific evidence suggests that the universe is not headed toward a "big crunch," contrary to what is required by an oscillating theory of the universe. However, I do not think this is an especially strong reason for out-and-out *rejection* the possibility that our universe is the most recent in a series of universes. It is doubtless true that the present state of the scientific evidence does not *support* this possibility over any other that we can think of in our more speculative moments. But unless it is assumed that previous universes would have had the same basic composition and laws as ours, the possibility remains open that each of them ended in such a way as to enable the production of yet another universe. As far as the scientific evidence is concerned, the right course may simply be to suspend judgment about what did or did not happen "prior" to the big bang. It is fun to speculate, but I doubt that the empirical evidence by itself warrants belief one way or the other. That is one reason why I think the a priori arguments for an absolute beginning discussed in this paper are so important to the success of the *kalām* argument.

6 "The Existence of God and the Beginning of the Universe," *Truth: A Journal of Modern Thought* 3 (1991): 85–96. (http://www.leaderu.com/truth /3truth11.html). For ease of exposition, I have reversed the order of Craig's premises and re-numbered them.

7 The precise way in which Craig thinks it makes the difficulty worse will be discussed in the next section.

8 "Professor Mackie and the *Kalām* Cosmological Argument," *Religious Studies* 20 (1985): 367-375.

9 "The Existence of God and the Beginning of the Universe."

10 "Philosophical and Scientific Pointers to Creation *ex nihilo*", 189-90.

11 "The Existence of God and the Beginning of the Universe."

12 "The Existence of God and the Beginning of the Universe."

13 This line of argument was originally suggested to me by the comments of David Oderberg, who was the designated respondent to an earlier version of this paper that I presented at the meeting of the Evangelical Philosophical Association (in conjunction

with the meeting of the American Academy of Religion) in Denver on November 18, 2001. However, I have developed the argument in my own way, and Oderberg is not responsible for my interpretation (or for any possible misunderstanding) of his remarks.

14 Indeed, Craig is careful to distance the *kalām* argument from the Leibnizian argument from contingency. See the introductory paragraphs of "The Existence of God and the Beginning of the Universe."

15 It is not entirely clear where Craig stands on this issue. He has for the most part defended a relational view of time on which it is impossible for time to exist in the complete absence of events (other than the passage of time itself). (See, for example, "Philosophical and Scientific Pointers to Creation *ex nihilo*", 197-8.) That is why he thinks (i) that there could be no "empty" time prior to the first event, (ii) that God must be timeless "prior" to the first event in metaphysical time, and (iii) that God is the timeless creator of time. Nevertheless, I suppose it might be just possible for Craig to defend the view that, while the series of temporal intervals (TS) could not have existed without *any* events, it might have existed without *this* series of events (ES). In that case, the precise correlation between TS and ES might still be a contingent fact – and one that (given the principle of sufficient reason) would require explanation. As far as I can see, however, such a view of the relation between the passage of time and the happening of events has little to recommend it apart from the need to make out the present argument against the possibility of an infinite past. However a full and fair exploration of the ontological status of time is beyond the purview of the present paper.

16 Barbara Morriston suggested this example to me.

17 Such an argument would be somewhat similar to Leibniz's defense of the claim that "instants apart from things are nothing." Leibniz thought it was necessary to choose between the principle of sufficient reason and a substantivalist of time. See the third paper in the Leibniz-Clarke correspondence (paragraph 6), where Leibniz argues as follows: "Suppose someone asks why God did not create everything a year sooner; and that the same person wants to infer from that that God did something for which He cannot possibly have had a reason why He did it thus rather than otherwise, we should reply that his inference would be true if time were something apart from temporal things, for it would be impossible that there should be reasons why things should have been applied to certain instants rather than to others, when their succession remained the same. But this itself proves that instants apart from things are nothing, and that they only consist in the successive order of things; and if this remains the same, the one of the two states (for instance that in which the creation was imagined to have occurred a year earlier) would be nowise different and could not be distinguished from the other which now exists." (*Leibniz: Philosophical Writings,* tr. by Mary Morris (E. P. Dutton: London and New York, 1956), 200.)

18 By "ontologically independent", I mean that it is possible in the "broadly logical" sense that those times could have existed without those events.

19 It is also interesting to note that this "sufficient reason" argument has nothing to do with the *successive addition* of events. To see this, imagine an infinite time of the B-series sort that is completely filled by an actually infinite series of events. Now arbitrarily designate a time T in the B-series of times. There are infinitely many temporal positions earlier than T, and infinitely many events located at those positions. Given well-known properties of the actual infinite, different pairings of events and times are logically possible. So one could just as easily ask, "Why are the infinitely many events located at this infinite series of times, rather than at some earlier infinite series of times?" Assuming that the B-series of times is (i) independent of the B-series

of events, and (ii) that the B-series of times is completely homogenous, no answer is possible. That is a problem, of course, only if you accept a version of the Principle of Sufficient Reason strong enough to require an answer. But what is noteworthy here is that the argument has nothing to do with *successive addition* or with Craig's claim that one cannot complete an infinite series. Instead of giving a straightforward defense of the successive addition argument, it seems that we have merely changed the subject, offering a quite different line of argument against the infinite past.

20 William Lane Craig, *Reasonable Faith: Christian Truth and Apologetics* (Wheaton, Ill.: Crossway, 1984), 97.

21 That is, in any infinite set that might be instantiated in reality. Craig has always said that he has no wish to drive mathematicians from their "Cantorian paradise." But he also acknowledges that he is committed to a non-realist view of mathematics.

22 By David Oderberg. See note 11 above.

23 The event-bound view of time I have been assuming here might have to be qualified slightly to allow for the possibility of temporal gaps in which no events are occurring. But the possibility of such "gaps" would have no bearing on the present question, since newly past events are always added onto the "end" of the series of past events. Even if there were a temporal "gap" at the tail end of the series, the newly past event would not go into that gap but would come right after it.

24 This comparison is not perfect, of course. The rooms in the hotel are distinct from and independent of the guests who occupy them; whereas on the working hypothesis I have adopted, the passage of time just is the occurring of events. But see note 23.

25 *Theism, Atheism, and Big Bang Cosmology,* 96. My italics.

26 Actually, this is Euclid's fifth axiom. See William Lane Craig (with Quentin Smith), *Theism, Atheism, and Big Bang Cosmology*, 23ff.

27 The scope of CM should be limited to sets instantiated in the "real world." See note 16 above.

28 "The Existence of God and the Beginning of the Universe."

29 "The Existence of God and the Beginning of the Universe."

30 The issues are rather different with respect to transfinite ordinal arithmetic. For a brief discussion, see Graham Oppy, "Inverse Operations With Transfinite Numbers and the Kalam Cosmological Argument", *International Philosophical Quarterly,* 35, 2, 219-221.

31 *Theism, Atheism, and Big Bang Cosmology,* 15.

32 And if it were contradictory, then, contrary to what Craig supposes, it would deprive mathematicians of their "Cantorian paradise." Logical consistency is at least as important in mathematics as it is in the "real world!"

33 *Theism, Atheism, and Big Bang Cosmology,* 24.

34 *Theism, Atheism, and Big Bang Cosmology,* 25.

35 Another set of implications is also noteworthy. If metaphysical time needn't have a beginning, then, contrary to what Craig supposes, there is no reason to think that there is a first event in God's life, and consequently no reason to think either that God is the creator of time or that he is timeless *sans* creation.

36 I would like to thank David Oderberg for an exceptionally stimulating set of criticisms directed at an earlier (and much slimmer) version of this paper. (See note 11 above.) I would also like to thank Barbara Morriston, Jonathan Peeters, and the Editor of this journal for their helpful comments and suggestions.

4

Craig on the Actual Infinite

Wes Morriston

In a series of much discussed articles and books, William Lane Craig has vigorously defended the view that the past could not consist in a beginningless series of events.[1] Craig's goal, of course, is to make a strong case for the existence of God. If the past has a beginning, then so does the universe, and a familiar line of argument suggests that there must be a First Cause.[2] In the present paper, I cast a critical eye on just one part of Craig's case for the finitude of the past – viz. his philosophical argument against the possibility of actually infinite sets in the 'real world'.[3] If this argument were to succeed, then an actually infinite series of past events would have been proved impossible, and we could go on to ask about the cause of the very first event. However, I do not believe that Craig has succeeded in proving that actually infinite sets are impossible. As far as this particular line of argument is concerned, I shall try to show that it remains an open question whether the past could consist in a beginningless series of events. I shall also take a close look at several considerations that are often thought to favour the possibility of an actual infinite, arguing in each case that Craig's response is inadequate.

'Absurd implications'

Craig's main line of argument against the possibility of an actual infinite charges that 'various absurdities' would result 'if an actual infinite were to be instantiated in the real world'.[4] For example, there would be no logical bar to the existence of an 'infinite library' in which every other book has a red cover and the rest have black covers. Such a library would have some quite remarkable – and, to Craig's way of thinking, utterly impossible – properties. One could add as many books as one liked without increasing the number of books in the library. One could remove any finite number of books without decreasing the size of the library. And since the library would have no more red- and black-covered books together than black-covered ones alone, one could remove all the red-covered books without decreasing the number of books in the collection.

Doubtless this feature of the infinite library is 'weird' and 'paradoxical'. But is it genuinely absurd and impossible? Is it a metaphysically necessary truth that the

number of elements in any legitimate set must be greater than the number of elements in any of its proper subsets? This, I believe, is the central issue, and in the next section, I shall consider what we should say about it. But there are a number of other supposedly 'absurd' implications of the actual infinite that Craig also likes to emphasize. The rest of this section will be devoted to them. For example, Craig claims that the gaps created by the removal of all the red-covered books from the shelves of our imaginary library could be filled without adding any new books. 'The cumulative gap created by the missing books would be an infinite distance, yet if we push the books together to close the gaps, all the infinite shelves will remain full'.[5]

Craig's way of putting this point is a bit misleading, since we obviously cannot 'push' any of the books together without creating some new shelf space. If we were to 'push' even two books together, we would have created space for at least one new book. What is true, however, is that the infinitely many remaining books could – at one stroke, so to speak – be assigned to new spaces in such a way that no gaps would be left on the shelves. All parties to the present dispute would presumably agree that such a monumental reassignment is physically impossible, but Craig holds something stronger – viz. that there is no possible world in which such a 'closing of the gaps' by way of 'infinite reassignment' could be accomplished. God Himself could not pull off such a thing.

Even if Craig is right about this, and it really is absurd to suppose that the 'cumulative gap' created by the removal of the red books could be 'closed' by cleverly moving the books to different locations, it does not immediately follow that infinite sets *in general* are impossible. Before drawing so sweeping a conclusion, we need to consider what it is in the example that produces the (allegedly) absurd implication. The answer, I think, can be found in the way in which the number of elements in the set interacts with other features of the example. A library is a collection of *coexistent* objects (books and shelves) whose physical relationship to one another can be *changed*. It is only when these features are *combined* with the property of having infinitely many elements that we get this particular sort of implication. If the infinitely many books and spaces for books did not exist at the same time, there could be no thought of rearranging them. And a fortiori, if it were (metaphysically) impossible to move the books to different locations, it would again be impossible to rearrange them.

The upshot is that even if it really is 'absurd' to suppose that one could close the empty spaces in Craig's infinite library merely by rearranging the books on the shelves, this particular sort of 'absurdity' cannot be duplicated for just any actually infinite set.[6] Significantly, it cannot be duplicated for an infinite series of past events. Events that have happened are fixed in their temporal locations. They cannot be changed or rearranged in such a way as to open or close temporal locations. Even if it should turn out that *other* absurdities afflict the idea of an infinite past,[7] this cannot be one of them.

Yet another twist to the infinite library scenario that Craig likes to emphasize goes like this. If an infinite library existed, its books could be numbered sequentially, beginning with 0, in such a way that every natural number is printed on the spine of exactly one book. In that case, Craig claims, it would be impossible to *add* any books to the library, since all the numbers for such additions would already have been 'taken'. It

would be necessary to create a new number – something that is obviously impossible. Since one can always add a book to any real library, Craig thinks it follows that an actually infinite library is impossible.

You might think that the books in an infinite library could simply be renumbered so as to release a number for the new book. For example, book 0 might be renumbered as book 1, book 1 as book 2, and so on. Zero would then be available. But Craig rejects this possibility, on that ground that it would violate 'the initial conditions laid down in the argument', according to which '[w]e are to imagine a series of consecutively numbered books beginning at 0 and increasing infinitely, not a series of books numbered from some finite number'. 'Once the objects are numbered as stipulated', Craig says, 'reassigning the numbers to begin with the proposed addition seems impossible'.[8]

It is not immediately clear why Craig thinks such a reassignment would contradict the 'initial conditions' of the example. What we were asked to suppose was that the books in the library were numbered from zero onwards *before* any new books were added – *not* that the numerals on the spines of the books could not be changed to accommodate new books. We would be violating the 'initial conditions' of the example only if we supposed that the books were not *initially* assigned to the natural numbers, beginning with zero.

Craig appears to think that the set of books in the library must be just as complete and unalterable as the set of natural numbers itself:

> Is it possible to add a new integer to the series of natural numbers? Of course not, for the natural number series is determinate and complete . . . . But just as we cannot add more numbers to the natural numbers, so we cannot add more books to an infinite collection of books each of which stands in a one-to-one correspondence with the natural numbers . . . . Therefore, just as the collection of natural numbers could not be added to, neither could an actually infinite collection of books – which is absurd.[9]

This argument is deeply flawed. It is true, of course, that one cannot create a new natural number and add it to the set of all natural numbers. That is because the set of natural numbers is the 'determinate and complete' set *of all possible natural numbers.* But an infinite library – even one whose volumes have been placed in one-to-one correlation with the series of natural numbers – is not to be confused either with the *complete* set of *all possible books,* or even with the set of all actual books. So, contrary to what Craig seems to assume, there is no reason at all to think that the way in which the books are correlated with the natural numbers (via the numerals on the spines of the books) must share the immutability of the natural numbers themselves. Nor, consequently, is there any reason to deny that the books in the infinite library could be renumbered in such a way as to make room for a new one.

It is true, of course, that *we* could never complete the process of replacing the numerals on the spines of the books, since *we* could only renumber finitely many books at a time. But that is merely a reflection of our limited power, and has nothing to do with the possibility of an infinite set. Presumably God would have enough power

to do the job – 'at one stroke', so to speak – without having to start out on an endless series of renumberings.

Analogous errors are present in another of Craig's arguments – this one directed specifically against the infinite past. He asks us to imagine someone 'who claims to have been counting from eternity, and now . . . is finishing: −5, −4, −3, −2, −1, 0'.[10] Craig argues that this is impossible, on the ground that the count should have been finished before now. Indeed, he says, if the past is really beginningless the count should have been finished before any given time in the past. Since the count must always already have been finished, there in no time at which such a person could be finishing his count. The moral: just as no one could have been counting numbers 'from eternity', so too there cannot have been 'events from eternity'.[11]

The parallel with the previous argument should be obvious. Just as Craig thinks all the numbers have been 'used up' in our infinite library, so too he apparently thinks that at any stage of his count, our infinite counter must already have 'used up' all the numbers, so that no number is left 'free' for use at that stage.

But this is the wrong way to look at the infinite counter's story. It is true that at any moment in the past, the man had already counted off infinitely many numbers, but it does not follow that he had already counted off *all* the numbers or that he had already reached zero. Perhaps that *could* have been the way the man's count went. But it was not, and so zero is still available today. Ironically, it is Craig who is here guilty of tampering with the 'initial conditions' of the example!

Another point worth noting is that, unlike the numerals on the spines of the books in our infinite library, which *can* at least in principle be changed, the series of past 'countings' cannot be changed precisely because they are *past*. If, one minute ago, the man did in fact reach −1 then zero is still available and there is nothing Craig or anybody else can do about that. It's no use trying to 'renumber' the man's past in such a way that zero is already taken!

Yet another supposedly 'absurd' implication of the actual infinite that Craig likes to stress concerns inverse mathematical operations. Here, he says, the actual infinite entails out-and-out 'logical contradictions', making the case against the actual infinite absolutely 'decisive'.[12]

Precisely what 'logical contradictions' does Craig have in mind here? As nearly as I can tell, they are supposed to emerge in the following passage, in which Craig once again illustrates his point by reference to the infinite library.

> Suppose books 1, 3, 5, . . . are loaned out. The collection has been depleted of an infinite number of books, and yet we are told that the number of books remains constant . . . . But suppose we were to loan out books 4, 5, 6, ... At a single stroke the collection would be virtually wiped out, the shelves emptied, and the infinite library reduced to finitude. And yet, we have removed *exactly the same number* of books this time as when we removed books 1, 3, 5 . . . .[13]

Well, yes, it's true that if all the odd-numbered books were removed, infinitely many books would remain, whereas if all the books numbered 4 and higher were removed,

only four books would remain in the library. {0, 1, 2, 3} has only four members, whereas {0, 2, 4, . . .} is denumerably infinite. But where is the contradiction?

Craig appears to be assuming that certain familiar arithmetical operations can be performed on the number of elements in any legitimate set. Given this assumption, perhaps we can see what the 'contradiction' is supposed to be. Let m = the number of books in our infinite library, n = the number of odd-numbered books, and o = the number of books numbered 4 or higher. Then perhaps Craig's argument goes like this:

$$(m - n) = \text{infinity, whereas } (m - o) = 4.$$

But,

$$n = o \text{ (since both } n \text{ and } o \text{ are infinite).}$$

It follows that we get inconsistent results subtracting the same number from *m*.

Or do we? If we say that $(m - n)$ = infinity, but that $(m - o) = 4$, we are not actually subtracting *numbers* at all. What we are doing instead is imagining various subsets of books in our infinite library being 'removed' from the library, and then determining the cardinality of the subset that 'remains'. When the set of books, {4, 5, 6, . . .}, is 'removed', {0, 1, 2, 3} 'remains'. Its cardinality is 4. When {1, 3, 5, . . .} is 'removed', {0, 2, 4, . . .} 'remains'. Its cardinality is $\aleph_0$. There is no logical inconsistency so far. But what if we insist on subtracting the *numbers, n* and *o,* respectively, from *m*? Even then, we will not get inconsistent results. For no matter how $(\aleph_0 - \aleph_0)$ is defined, both $(m - n)$ and $(m - o)$ will produce exactly same 'remainder', since *m, n,* and *o* just are $\aleph_0$.

But of course there is no definition for $(\aleph_0 - \aleph_0)$ in Cantor's system, and in mathematics generally, 'infinity minus infinity' is left undefined.[14] Craig thinks this just goes to show that there is something wrong with infinite sets. But why should we accept Craig's assumption that ordinary subtraction *must* apply to the number of elements in *any* set that can be instantiated in 'the real world?' Why think that what holds true for finite sets must also hold for infinite ones? Here is Craig's explanation:

> It may be said that inverse operations cannot be performed with the transfinite numbers – but this qualification applies to the mathematical world only, not the real world. While we may correct the mathematician who attempts inverse operations with transfinite numbers, we cannot in the real world prevent people from checking out what books they please from our library.[15]

And elsewhere he writes: 'mathematicians recognize that the notion of an actually infinite number of things leads to self-contradictions unless you impose some wholly arbitrary rules to prevent this'.[16] Craig here claims that it is 'arbitrary' to deny that inverse operations apply to infinite sets, leaving 'infinity minus infinity' undefined. 'In the real world', he says, addition and subtraction must always be possible. If a person 'checks out' a book from a library, he has 'subtracted' one book. If he 'checks out' all the odd-numbered books, he has 'subtracted' infinitely many books. And so on. So if a mathematician chooses to define a transfinite number (such as Cantor's $\aleph_0$) for which

this operation is not possible, he is free to do so – but no set having that number of elements can then be instantiated 'in the real world.'

This argument is badly confused. If a person 'checks out' one or more books, he does indeed remove them from the library – but he is not 'subtracting' them in the arithmetical sense. And even if ordinary arithmetical subtraction is undefined for transfinite numbers, it does not follow that physically removing books from an infinite library is similarly 'undefined', much less that removing books from it is impossible. What follows is only that, since subtraction is undefined for infinite quantities, we cannot automatically assume that the *number* of books is smaller after some of them have been removed. That is indeed a characteristic of the actual infinite, but it is hardly a 'logical contradiction.'

This point can be generalized as follows. Addition and subtraction of *numbers* is one thing; constructing a new set by adding in new members or removing old ones is quite a different thing. Operations of the second sort maybe possible even when operations of the first sort make no sense or are undefined. It is only by confounding the two sorts of operation that Craig can imagine that he has derived a 'logical contradiction' from the actual infinite.

A deeper analysis

So far, we have seen that Craig argues that the instantiation of an actual infinite in reality would lead to absurdity, and even to logical contradiction. But he wants to dig deeper. What is it about the actual infinite, he asks, that generates all of these absurdities? Here is his answer: 'It seems to me that the surd problem in instantiating an actual infinite in the real world lies in Cantor's Principle of Correspondence. The principle asserts that if a one-to-one correspondence between two sets can be established, the sets are equivalent'.[17] Given the Principle of Correspondence, we are forced to say that 'a proper subset of an infinite set is equivalent to the whole set'. Craig finds this result 'strange' because he thinks it runs counter to what he refers to as 'Euclid's maxim'[18] – viz. the intuitively plausible principle that the whole must be greater than a part. As it applies to sets, Craig supposes the maxim says that a set must have a larger number of members than any of its proper subsets.

Craig acknowledges that in mathematics 'Euclid's maxim holds only for finite magnitudes, not infinite ones'.[19] But he is not impressed by this way of dealing with the problem: 'But surely the question that then needs to be asked is, How does one know that the Principle of Correspondence does not also hold for finite collections, but not for infinite ones? Here the mathematician can only say that it is simply defined as doing so.'[20] In Cantor's theory, Craig points out, equivalent sets are 'simply defined' as 'sets having a one-to-one correspondence'. As he sees it, this supports his own contention that the infinite sets of Cantorian set theory cannot be instantiated in the real world. The Principle of Correspondence, he says, 'is simply a convention adopted for use in the mathematical system created by the mathematicians'.[21]

At this point, one might have the impression that Craig has serious doubts about the Principle of Correspondence – at least as applied to sets in the 'real world'. But that is apparently not how he wants to be understood. A few sentences further on, he asserts that both the Principle of Correspondence and Euclid's maxim are 'intuitively obvious'. And since 'counter-intuitive situations' result when they are 'applied to the actual infinite', he concludes that 'the most reasonable approach is simply to regard both principles as valid in reality and the existence of an actual infinite as impossible'.[22]

Craig is a bit difficult to interpret at this point. But I think it is clear that he holds that both the Principle of Correspondence and Euclid's maxim are valid for sets instantiated in the 'real world'. And what he wants to prove is that no infinite sets can be instantiated in 'the real world'. With this understood, we can see how Craig's main line of argument must go. 'In the real world', it says, both of the following principles are true:

(1) If there is a one-to-one correspondence between two sets, they must have the same number of elements. (This is the Principle of Correspondence.)
(2) The number of elements in a set must be greater than the number of elements in any proper subset of that set.[23] (This is Euclid's maxim, as Craig thinks it applies to set theory.)

But it is also true that:

(3) If there were an infinite set in the 'real world', its elements could be placed in a one-to-one correspondence with a proper subset of itself.

From these premises, it follows that:

(4) There are no infinite sets in the 'real world'.

This way of putting Craig's argument has the merit of making it clear just what the principal issue is. On Cantor's theory, premise (2) is true for finite sets, but not for infinite ones. Craig, on the other hand, insists that (2) would have to be true of any set that is instantiated 'in the real world'. So if infinite sets cannot be squared with premise (2), so much the worse for such sets – they cannot be instantiated 'in reality'.

It should be emphasized that Craig's argument requires the truth of *both* Euclid's maxim (suitably interpreted) *and* the Principle of Correspondence. Without the latter, he cannot derive the (supposedly) 'absurd' consequences from an actual infinite; and without the former, he has no reason for thinking them absurd.

What is there to say in support of the way Craig applies Euclid's maxim to 'real world' sets? Why should we suppose that premise (2) applies to *all* legitimate sets? Craig's stock answer is to point once again to the intuitive 'absurdity' of infinite libraries and hotels and the like.[24] But we need to be careful here. Many of these supposedly 'absurd' implications are so only because they appear to violate Euclid's axiom by leaving open the possibility of sets having no 'more' members than various proper subsets of those sets. If, for example, we think it is absurd to suppose that

we can add or remove books from our imaginary library without increasing or decreasing the 'size' of an infinite library, that is because we are already committed to the view that in the 'real world' *all* sets (even infinite ones) are subject to Euclid's maxim. Craig's examples *illustrate* the violation of this principle, and they doubtless stimulate 'anti-infinitist' intuitions in some readers, but they do not *establish* the truth of premise (2) of the argument.

There is also quite a lot to be said *against* the way Craig applies Euclid's maxim to sets. Even if we agree to treat sets as 'wholes' and their proper subsets as 'parts', Euclid's maxim need not be interpreted to mean that the *number* of elements in the whole is greater than the *number* of elements in the part. There is, for example, an obvious sense in which Craig's imaginary library is 'greater' than any of its parts, and this is so despite the fact that it does not have a greater *number* of books than they. For instance, the library as a whole is 'greater' ('larger') than the part of the library containing only books numbered 3 and higher simply in virtue of the fact that it contains books numbered 0, 1, and 2 as well as all the higher numbered books. This is all by itself a perfectly legitimate sense of the word 'greater' – one that is logically independent of the question, 'What is the *number* of books in the two sets?'[25]

There is, then, a fairly intuitive sense in which any set – even an infinite one – is 'greater' than any of its proper subsets. Not because the *number* of elements in the greater set is necessarily larger than the number of elements in the lesser one – but merely in virtue of the fact that it 'contains' all the elements in the lesser set plus some others that the lesser one does not contain. That, all by itself, and without any reference to the *number* of elements in either set, is sufficient to make one 'greater' than the other. When it is understood this way, an actually infinite set does *not* violate the principle that the 'whole' is greater than its 'part.'

It is true, of course, that the number of elements in any *finite* set is necessarily greater than the number of elements in any of its proper subsets. But why think this must hold for *all* sets in the 'real world'? Euclid's maxim about wholes and parts may be 'intuitively' obvious; but as we have just seen, this provides little, if any, support for premise (2). I would even go so far as to say that it is 'intuitively obvious' that Craig's infinite library is 'greater' than any of its proper parts, even though it does not have a greater number of books than some of those parts.

Admittedly, if it could be established on independent grounds that only finite sets can exist in the real world, it would follow that Craig's premise (2) holds for *all* real world sets. But that observation is of no use to us here, since the very question we are trying to settle is whether it is true that only finite sets can exist in the real world. To derive the impossibility of the actual infinite from premise (2) (together with some other premises), while at the same time deriving premise (2) from the claim that the real world can contain only finite sets, would be to argue in a very tight – and vicious – circle.

Where does this leave us? The logical situation would seem to be as follows. Premises (1), (2), and (3) (at least in their full generality) are logically incompatible with the possibility of an actual infinite. Something has to go. Craig thinks it is the possibility of an actual infinite that must be rejected. But since he has given no independent

argument for affirming (1), (2), and (3), the friends of the actual infinite have just as much right to say that one of those propositions should be rejected. And if, on the basis of Cantor's theory of transfinite numbers, they say that (2) holds only for finite sets, it will be difficult for Craig to come up with an objection that does not beg the question against them. So far, at any rate, he has not done so.

Existence in reality vs existence in God's mind

In spite of the absurdities – and even 'contradictions' – Craig claims to have found in the idea of an infinite set, he says that he has no intention of 'trying to drive mathematicians from their Cantorian paradise'. He claims only that infinite sets cannot be instantiated 'in reality'.[26]

The first part of this claim is rather puzzling. It is hard to see why mathematicians should be any less concerned about genuine contradictions than anyone else. The rules that govern the 'mathematical realm' are surely not that much more relaxed than those that govern reality!

But the second part of Craig's claim also deserves attention. What, exactly, does he mean by 'real' when he says that infinite sets cannot exist 'in the real world'? Here is his explanation: 'When I say that an actual infinite cannot exist, I mean "exist in the real world" or "exist outside the mind" . . . [w]hat I am arguing is that an actual infinite cannot exist in the real world of stars and planets and rocks and men.'[27] It seems, then, that when Craig denies that there is an actual infinite 'in reality', he is denying merely that there is an actual infinite 'outside the mind'. Since there are infinitely many numbers and properties and other abstract entities, it follows that such things can exist only 'in thought' or 'in a mind'. Platonism is out, and conceptualism is in.

This might seem to leave Craig with the following problem. It is obvious that there are infinitely many abstract entities that no human person has ever thought of. In what sense do these things exist 'in the mind'? How can they have even 'conceptual reality' on Craig's view? Craig puts the problem this way.

> In addition to tangible objects like people and chairs and mountains and trees, philosophers have noticed that there also appear to be abstract objects, like numbers and sets and propositions and properties. These sorts of things seem to have a conceptual reality rather like ideas. And yet it's obvious that they're not just ideas in some human mind. So what is the metaphysical foundation for such abstract entities?[28]

For a theist, Craig thinks there is an easy solution. He can simply say that abstract entities are 'grounded in the mind of God'.[29] Craig endorses the following statement by Alvin Plantinga: 'It seems plausible to think of numbers as dependent upon or even constituted by intellectual activity. But there are too many of them to arise as a result of human intellectual activity. We should therefore think of them as . . . the concepts of an unlimited mind: a divine mind.'[30] It seems, then, that numbers (to say nothing

of the all other abstract entities in Plantinga's ontology) are to be thought of as ideas or concepts in an infinite mind. For numbers and other abstract entities, *to be* is *to be conceived by God.*

Are there infinitely many abstract entities in God's mind?

Whatever the merits of Craig's view of the ontological status of abstract entities, it is difficult to see why an actual infinite existing in God's mind should be thought less objectionable than one existing apart from God's mind. For even if 'Cantor's paradise' is located in God's understanding, it seems that many of the paradoxes Craig finds so objectionable can still be generated inside God's mind.

Craig is well aware of this problem, but he thinks it is easily solved. 'In the first place', he says, 'one need not be conceptualizing consciously all that one knows. I know, for example, the multiplication table up to 10 although I am not consciously entertaining any of its individual equations, so that my knowledge of the multiplication table does not imply that I have 102 ideas'.[31] True enough. One need not have, consciously present to one's mind, a distinct idea for each of the operations that one's knowledge of the multiplication table enables one to perform. On the other hand, one must be *capable* of having each of the 102 ideas'. They must be at least *potentially* present within one's mind.

Is that what Craig wants to say about God? That God knows all of mathematics by virtue of having some sort of 'super-disposition' that makes Him *capable* of answering every possible mathematical question? I doubt it. Knowledge that is merely potential in us must somehow (I think Craig would agree) be actual in God. But since the number of mathematical truths (to say nothing of all the other eternal truths concerning properties and propositions and the like) is clearly infinite, it follows – does it not? – that an *actual* infinity is present in God's knowledge.

Not at all, says Craig. The divine conceptualist can consistently deny that there is any multiplicity at all in God's knowledge. How could this be? Craig explains:

> . . . the Conceptualist may avail himself of the theological tradition that in God there are not, in fact, a plurality of divine ideas; rather God's knowledge is simple and is merely represented by us finite knowers as broken up into knowledge of discrete propositions and a plurality of divine ideas.[32]

This new twist in Craig's argument is puzzling, to say the least. First, we are told that the conceptualist would be well advised to hold that abstract entities are ideas in God's mind, since there are simply *too many* of them for any finite mind to contain them all. Then we are informed that there is no multiplicity at all in God's mind – not even a multiplicity of ideas or concepts. How, then, are we to understand the relation between God's knowledge, which is supposed to be simple, and the many abstract entities that are supposed to exist 'in' this simplicity? How is God's awareness of numbers and properties and propositions and other abstract entities to be understood?

One possibility would be to distinguish sharply between God's awareness and the object of His awareness. God's act of awareness might be simple and internally undifferentiated, even if it embraces many different objects. On this picture, it would not be right to say that God's mind contains many distinct ideas, but it would be right to say that it contains a single idea *of* many different things.

If this were what Craig meant, it would not help him avoid the actual infinite. Even if God has just one 'idea' of everything, it will have to be an idea *of* something that is complex enough to include all abstract entities (numbers, properties, propositions, and the rest). But in that case, the *object* of God's knowledge will contain an actual infinity of logically distinct items – and this will be so whether or not they all somehow 'depend' on His awareness.

So Craig must have something else in mind. What could it be? Craig offers few details. He cites Aquinas, who holds that God knows everything by knowing His own simple self. Since Craig does not himself accept the full Thomist doctrine of simplicity, he refers the reader to a well-known article by William P. Alston,[33] where it is supposed to have been established that subscribing to the simplicity of God's knowledge 'does not commit one to a full-blown doctrine of divine simplicity'.[34]

In the essay cited by Craig, Alston does not defend divine conceptualism – he is concerned only to argue that God does not have beliefs. The Thomist view of divine knowledge comes into the discussion because Alston takes it to be a paradigmatic example of a non-propositional view of God's knowledge – a view on which it would make no sense to represent God as having beliefs. Although Alston does not recommend the Thomist conception of God's knowledge, he does what he can to make sense of the suggestion that the content of God's knowledge does not consist in a plurality of propositions. However – and this is of critical importance – nothing in Alston's discussion can reasonably be construed as a defense of the claim that there is no other sort of multiplicity either within God's intellect or in the object of God's knowledge. On the contrary, as we are about to see, Alston's best effort to account for the unity of God's knowledge seems implicitly to view it as a unity *in* diversity.

To give us some idea of what it could mean to say that God's knowledge consists in a single non-propositional awareness of everything, Alston suggests that we 'think of divine knowledge as like our initial visual perception of a scene, where we have not yet begun the job of extracting separately statable facts . . .'.[35] But Alston quickly points out that the analogy is inadequate, for the obvious reason that in human beings non-propositional awareness is far lower in cognitive value than propositional knowledge. So Alston tries another tack, borrowing a pair of categories from F. H. Bradley. On Bradley's account, the immediacy of pure 'feeling' is contrasted with discursive knowledge, and the ultimate goal of thought – not realized in any human being, but only in the Absolute – is a sort of Hegelian synthesis of these two. Alston's idea is that God's knowledge has 'all the richness and articulation' of discursive thought, held together in a 'unity' that is 'as tight and satisfying as that of pure immediacy'.[36] 'Strangely enough', he writes, 'this bit of British Hegelianism serves rather well as a model for the Thomist conception of divine knowledge and of the way in which it compares with human knowledge'.[37]

On Alston's proposal, then, God's knowledge is certainly not chopped up into a plurality of *propositional states.* On the other hand, it is said to have 'all the richness and articulation' of discursive thought. Even if this 'richness and articulation' does not consist in a multiplicity of *propositional beliefs,* it must surely involve some sort of distinction and variation and multiplicity within the divine intellect. However 'tight and satisfying' the unity of God's knowledge, it must be thought of as a unity within a multiplicity – a one in a many.

It seems, then, that Alston's (tentative) suggestion has no clear bearing on the question whether there must be an actual infinite within God's intellect to 'accommodate' all the abstract entities. Even if God's thought does not contain infinitely many *concepts* and *propositions,* it could still be infinitely articulated. And if, as Craig believes, *all* concepts and propositions that could ever be entertained by a finite mind (a potential infinite, if there ever was one!) are somehow embedded in a single divine thought, it might seem that this thought *must* be infinitely articulated. To be sure that this is not so, we would need to know quite a lot more about the 'articulation' of God's thought and about the way in which all the particular concepts and propositions and truths of human knowledge are related to it.

It will doubtless be said that on any theory of God's knowledge, it is bound to be utterly beyond our understanding – and that our inability to answer all the hard questions about its relation to particular concepts and propositions is not therefore a special mark against the simplicity theory. There may be something to this. In the present context, however, such a response would be completely inadequate. For Craig has endorsed a *theory* of the nature of abstract entities. Following Plantinga, he says that they have *conceptual reality* in the mind of God. Numbers, properties, propositions, and the rest are said to exist insofar as they are all somehow present in God's understanding. Craig needs to tell us what this claim means when it is combined with the view that there is no multiplicity within God's understanding.

On Plantinga's view, there is no such problem. Properties and numbers are God's concepts. Propositions are God's thoughts. In a paper favourably cited by Craig, Plantinga writes:

> . . . a proposition exists because God thinks or conceives it. For propositions, as I see it, are best thought of [as] the thoughts of God . . . . As we know, serious difficulties attend the claim that propositions are *our* thoughts; these difficulties fall away for the claim that propositions are *God's* thoughts.[38]

On the face of it, Plantinga's divine conceptualism is inconsistent with Alston's suggestion that God's thought is non-propositional. And in view of the vast multitude of logically distinct properties and numbers and propositions, it also seems inconsistent Craig's claim that there is no multiplicity in God's intellect.

Clearly, Craig has some explaining to do. He needs to come up with a version of divine conceptualism that makes sense of the idea that properties and numbers and propositions are somehow embedded in God's simple, non-propositional thought. And he must do this without introducing any sort of multiplicity into God's knowledge. It's

a tall order, and a blanket appeal to the 'otherness' and mystery of God's knowledge is plainly insufficient to fill it.

An infinite body of truth about the future?

A related area in which I think it is difficult for Craig to avoid the actual infinite concerns the future. Craig thinks that God (and we) will live forever. So there is a clear sense in which he is committed to the view that the series of future events is infinite. Craig argues that this is not an *actual* infinite, on the ground that the future is not real. Future events, he says, are not *real* until they happen. While there is no limit to the number of new events that will be added to those that have already taken place, we never arrive at a time at which *all* of them have happened. Since we never arrive at a completed infinity, Craig thinks the future is only *potentially* infinite.

This does not completely eliminate the problem, however, since Craig also maintains that there is (already) a *complete body of truth* about the future. According to him, there are no truth value gaps for future contingents. God already knows everything that will ever happen.[39]

Suppose, then, that there is an angel whose job is simply to 'count minutes'. At the moment of creation, the angel said 'one'. A minute later, he said 'two', and so on. The angel will continue in this manner forever. (Perhaps he is a 'fallen' angel, and this is his punishment.) From this supposition, it follows that there are infinitely many logically distinct 'truths' about what the angel will say at a given moment in the future. These truths constitute an *actual* (and not merely a potential) infinity, since they are *already* true. It is not just that the angel *can* always count another minute – it is already true that he *will* do so.

This does not mean, of course, that there will ever be a time at which the angel has finished his count. But the fact remains that each of his infinitely many 'countings', not only *can,* but *will* take place – one for each of the natural numbers greater than the one at which he has just arrived. For each of those infinitely many minutes there is *already* a distinct *truth* about what the angel will be saying at that time. And this is sufficient to bring back the main feature of the actual infinite that Craig finds so objectionable.

To see this, one need only observe that the number of 'truths' concerning the angel's use of even numbers in his 'count' is equal to the number of 'truths' concerning his use of odd-or-even numbers. But the former is a proper subset of the latter. So if we insist on applying both the Principle of Correspondence and Euclid's maxim (as Craig understands it) to this situation, we fall into contradiction.

Craig's solution to this problem is identical to the one he proposes for the seemingly infinite number of abstract entities. Due to our human limitations, we have to break Truth up into distinct propositions. Since *we* never arrive at a *complete* body of truths about the future, there is (for us) never more than a *potential* infinity of such truths. But God's knowledge is not broken up into an actually infinite set of distinct propositions. He does not know the future by knowing infinitely many distinct 'truths' about what is

going to happen. God knows Truth, not 'truths'. Neither in God's case nor in ours, then, is there an *actual* infinity of truths.[40]

I find this 'solution' very perplexing. First, there is the problem, already discussed in the previous section of this paper, of saying how the many particular truths are supposed to be related to God's knowledge. Are there any natural points of division within the one Truth? If so, how have we avoided the actual infinite? If not, then how is it that the many truths are embedded within it? But now we can see that it's actually worse than that. How, within the compass of a single internally undifferentiated Truth – a Truth containing no multiplicity – could there be any distinction between different sorts of truth? For example, between necessary truth and contingent truths? Or between contingent truths about the future and contingent truths about the past?

Nor is this all. For theists who, like Craig, hold a dynamic theory of time, God's knowledge of time must undergo continual change. Which events are still future, which are present, and which are now past? According to the dynamic theory, the correct answer is constantly changing, as more and more future events become present, present events become past, and past events sink farther and farther into the past. Since 'the body of tensed facts is constantly changing', Craig concludes that

> . . . a being which only knew all tenseless facts about the world, including which events occur at any date and time, would still be completely in the dark about tensed facts. He would have no idea at all of what is now going on in the universe, of which events are past and which are future. On the other hand, any being which *does* know tensed facts cannot be timeless, for his knowledge must be in constant flux, as the tensed facts known by him change.[41]

Assuming, then, that God is omniscient, His knowledge must somehow embrace all the facts, including 'tensed' ones. It follows that – in a certain small but important respect – His knowledge undergoes continual change. I do not see anyway to square this claim of Craig's with the alleged 'simplicity' of God's intellect. How, if there is no multiplicity in God's knowledge, can we distinguish between what does and does not change within it? Nor do I see any way to square the 'simplicity' thesis with the claim that God's knowledge is non-propositional. How, otherwise, could we distinguish between the 'part' of God's knowledge that concerns the past and the 'part' that concerns the future?

The infinite divisibility of space and the actual infinite

Whatever may be said about the 'reality' of abstract entities or about the number of 'truths' about the future, few philosophers would deny that space exists in the 'real world'. So if it could be shown that space has properties that entail the existence of an actual infinite, we would have good reason to believe that an actual infinite not only can, but does, exist in reality. For example, Michael Tooley has pointed out that if space is real and continuous, there must be infinitely many different finite sub-segments in a

given chunk of extension. This is not a merely potential infinite, since all the infinitely many sub-segments exist in reality.[42]

Craig replies by denying that space is 'continuous in the sense of being composed of . . . infinitely many points'.[43] But it is not at all clear that Tooley's argument presupposes that space is composed of points. Even if a region of space is not composed of points, it may still be true that there are infinitely many finite sub-segments within it.

Craig might reply that this misses his point. The fact that space is not composed of points entails that space does not come already 'chopped up' into sub-regions. There are, so to speak, no natural points for division within a region of pure space. It is divided up into two or more parts only when someone (at least in thought) makes that division. Any such region is, of course, infinitely divisible – but the 'parts' into which it can be divided are not 'there' until someone (at least in thought) marks them out. And since no one could complete *all* the possible divisions, they are only *potentially* 'there'. So what we have here is, after all, only a *potential,* and not an actual, infinite.

This is probably the best reply available to Craig, but I do not find it convincing. It seems to me that what follows from the lack of natural boundaries within a region of space is not that the infinitely many sub-regions are not actually 'there', but only that they are not 'there' *apart from a specified way of dividing things up.*

It is not difficult to come up with a specification relative to which the number of coexistent sub-regions is infinite. Just as we can specify the set of natural numbers all at once by the single rule, 'starting with one, add one to the previous sum ad infinitum', so too, I suggest that we can specify all the sub-regions of a given region *R relative to the following rule*: 'starting with *R,* divide the results of the previous division by half ad infinitum'. We do not have to rely on *natural* points of division within *R* to apply this rule to *R.* Nor do we need to *complete* the series of divisions in order to know that, *relative to this rule,* there is an *actual* – and not merely a potential – infinity of sub-regions. At least that's how it seems to me.

But even if I am wrong about this, it is interesting to note that Craig's reply to the 'infinite divisibility' objection is available only when the 'divisible' entity is completely homogenous – or at least when there is not an infinity of natural points for division within it. Space may be as good a candidate for this sort of treatment as we are likely to see. But as we saw above, God's knowledge is not. Even if it is concentrated in a single thought, God's knowledge will probably have to include enough internal multiplicity to support the claim that all abstract entities and all truths are somehow embedded in it.

Could space have been Euclidean?

As we have seen, Craig's main line of argument against the actual infinite relies heavily on Euclid's maxim ('the whole is greater than a part'). But there is another Euclidean intuition that seems to tell us that space is infinite. Euclid's second postulate ('a finite straight line can be extended continuously in a straight line') seems to entail that there

can be no 'end' to space. A line cannot be 'extended' unless there is somewhere for it to 'go', and in non-curved, Euclidean space, at any rate, it cannot retrace its steps. So it seems that Euclidean space must be infinite. The line itself is only potentially infinite (it 'can' always be extended), but the space in which it can always be extended must be an actual infinite.

But now we know better, you may say. Space is not Euclidean and it is not infinite. Fair enough. But Euclidean intuitions are real – real enough to have made non-Euclidean geometries a very hard sell. Indeed, non-Euclidean geometry remains extremely counterintuitive. To see this, imagine yourself travelling in a straight line. At the level of raw, untutored intuition, does it not seem impossible that you could ever arrive at the 'end of space' – at a 'here' beyond which there is no 'there'?

What this shows, I suggest, is that even very strong 'intuitions' sometimes have to be given up or qualified. The friends of the actual infinite may well think that Euclid's maxim about wholes and parts (as interpreted by Craig) is a case in point. However plausible it may seem at first glance, further reflection shows that it applies only to finite sets, and not to infinite ones.

But this is not all. Even if space is not in fact Euclidean, it seems obvious that it could have been.[44] There are possible worlds, so to speak, in which parallel straight lines never meet and in which finite straight lines can be extended indefinitely. In such worlds, space *is* actually infinite. So an actually infinite space is at least possible. I do not say that space *is* infinite. But I see no good reason to deny that it could have been.

In view of Craig's response to the infinite divisibility problem, you might expect him simply to deny that Euclidean space is infinite in the sense that is at issue here. If space is not composed of points – if there are no natural points of division within it – then Craig might claim that it does not contain an actually infinite set of sub-regions. We can in principle map out as many distinct, non-overlapping sub-regions as we please, but since (1) our mapping is only potentially infinite, and (2) the regions are not 'already there', prior to the mapping, it follows that the number of these sub-regions is only potentially infinite.

I do not think that this move is any more effective in defusing the present problem than it was with regard to the problem posed by infinite divisibility. It seems to me that the number of sub-regions of a Euclidean space would be actually infinite *relative to* any consistent way of dividing it up into distinct, finite, and non-overlapping sub-regions.

But even if I am wrong about this, it is hard to see why, if space had no boundaries, it could not have been filled with distinct objects of finite size. The number of distinct coexistent objects would then be infinite – and an actually infinite set would exist 'in reality', contrary to what Craig supposes possible.

As it happens, however, Craig does *not* respond to the problem posed by Euclidean intuitions about space by arguing that infinite space does not embrace an infinite set of sub-regions. What he does instead is simply deny that space could have been Euclidean. 'I would deny that physical space could be Euclidean in the sense of being actually infinite because the notion of an actual infinite ultimately results in self-contradictions.'[45] The only 'self-contradiction' Craig mentions is one we have already discussed and dismissed. What is 'infinity minus infinity?', he asks, 'Well,

mathematically you get self-contradictory answers. This shows that infinity is just an idea in your mind, not something that exists in reality.'[46] Apparently, Craig thinks no experimental evidence at all should have been needed to demonstrate that Euclid – and Newton – were wrong about space. It should have been enough merely to observe that actual infinity leads to self-contradiction!

Summing up

Craig has recently opined that 'any normal adult whose intuitions have not been jaded by the common textbook assertions that actual infinities are wholly unobjectionable' will find his argument against the actual infinite 'extremely plausible'.[47] I do not share this assessment of Craig's various arguments against the actual infinite.[48] Some of them appear to be question-begging, and others involve deep conceptual confusion. At the heart of the controversy is Craig's attempt to apply Euclid's maxim about wholes and parts to sets. While this principle (as interpreted by Craig) is uncontroversially true of all finite sets, I do not believe that we have been given any good reason to think that it *must* be true of *all* 'real world' sets.

Could there be any infinite sets in reality? I have suggested that space could have been Euclidean, in which case there could have been an infinite set of distinct, non-overlapping spatial regions.

Are there in fact any infinite sets in reality? Three considerations may be thought to favour an affirmative answer. (1) The infinite divisibility of any region of space strongly suggests that there is an actual infinity of (overlapping) sub-regions within any such region. (2) If numbers and properties and propositions and other abstract entities exist (even in God's mind), then there are infinitely many of them. (3) If, as Craig believes, there is a complete body of truths about an endless series of *future* events, then there are infinitely many truths about the future. Even if, as Craig suggests, all abstract entities and all truths are somehow 'embedded' in a single divine idea, it is hard to avoid the conclusion that this idea is infinitely articulated – that it is a 'one' in an infinite 'many'.

What about the past? Have there been infinitely many different past events? Or does the past have a beginning? I have not taken a position on this question. For all I know, the past *may* have a beginning and there *may* have been a First Event. But Craig's argument against the possibility of the actual infinite does not persuade me that this *must* be so.[49]

Notes

1 See especially William Lane Craig (with Quentin Smith) *Theism, Atheism, and Big Bang Cosmology* (Oxford: Oxford University Press, 1993), chs 1 and 3.

2 Matters are considerably more complicated than this, however. See Wes Morriston 'Must the beginning of the universe have a personal cause? A critical examination of the *kalam* cosmological argument', *Faith and Philosophy,* 17 (2000), 149–169.

3 Craig also argues that even if an actual infinite were possible, the series of past events could not be actually infinite since it is 'formed by successive addition', and no series formed in this way can be infinite. For critical evaluation of this argument, see Wes Morriston, 'Must the past have a beginning?', *Philo,* 2 (1999), 5–19.
4 Craig *Theism, Atheism, and Big Bang Cosmology,* 12.
5 Ibid., 15. As Craig points out, this is 'Hilbert's Hotel in reverse'. It will be recalled that 'Hilbert's Hotel' is the hotel with infinitely many rooms envisaged by David Hilbert. The hotel starts out full, but 'room' is made for infinitely many new guests by creatively reassigning the old ones to different rooms. For example, the guest in room 1 might move to room 2, the guest in room 2 to room 4, and so on.
6 The logic of the situation is as follows. If a set S is impossible because an absurd implication follows from features *a, b,* and *c* of set S, it does not follow that no set having feature *a* is possible. What follows is only that no set combining all three features is possible.
7 For example, if infinitely many days have passed by, then infinitely weeks must also have passed by. So an infinite past would not contain a greater number of days than weeks. Whether this sort of implication is genuinely absurd will be the main issue discussed in the next section below.
8 Craig *Theism, Atheism, and Big Bang Cosmology,* 96.
9 Ibid.
10 William Lane Craig 'Philosophical and scientific pointers to creation *ex nihilo*', in R. Douglas Geivett and Brendan Sweetman (eds) *Contemporary Perspectives on Religious Epistemology* (New York NY and Oxford: Oxford University Press, 1992), 189.
11 Ibid., 190.
12 Craig *Theism, Atheism, and Big Bang Cosmology,* 98.
13 Ibid., 15.
14 A slight qualification should be made. There are highly esoteric systems of transfinite *ordinal* arithmetic. But these systems do not entail contradictions. For the details, see Graham Oppy 'Inverse operations with transfinite numbers and the *kalām* cosmological argument', *International Philosophical Quarterly,* 35 (1995), 219–221.
15 Craig *Theism, Atheism, and Big Bang Cosmology,* 15.
16 William Lane Craig (with Michael Tooley), *A Classic Debate on the Existence of God* (November 1994, University of Colorado at Boulder). (http://www.leaderu.com/offices/billcraig/docs/craigtooleyo.html).
17 Craig *Theism, Atheism, and Big Bang Cosmology,* 23.
18 Actually, this is the Fifth Axiom of Euclid, which is not to be confused with the much discussed Fifth Postulate of Euclid.
19 Craig *Theism, Atheism, and Big Bang Cosmology,* 23.
20 Ibid., 23–24.
21 Ibid., 23.
22 Ibid., 24.
23 That is, if one set contains all the elements in another plus some additional ones, then the number of elements in the first set is greater than the number of elements in the second.
24 See, for example, William Lane Craig 'Professor Mackie and the kalam cosmological argument', *Religious Studies,* 20 (1985), 367–375.

25 Paul Draper has an excellent discussion of this point. See his 'The kalam cosmological argument', in Louis Pojman (ed.) *Philosophy of Religion,* 3rd. edn (Belmont, CA: Wadsworth, 1997), 42–47.
26 Craig *Theism, Atheism, and Big Bang Cosmology,* 12.
27 Craig 'Philosophical and scientific pointers to creation *ex nihilo*', 187.
28 Craig *A Classic Debate on the Existence of God.*
29 In ibid., this is one of the six arguments for the existence of God that Craig presents. God, he says, 'provides the best explanation for the existence of abstract entities'.
30 Alvin Plantinga 'Two dozen (or so) theistic arguments', paper presented at the 33rd Annual Philosophy Conference, Wheaton College, October 23–25 1986.
31 William Lane Craig 'A swift and simple refutation of the *kalam* cosmological argument?', *Religious Studies,* 35 (1999), 61.
32 Ibid.
33 William Alston 'Does God have beliefs?', *Religious Studies,* 22 (1986), 287–306.
34 Craig 'Swift and simple refutation of the *kalam* cosmological argument?', 61.
35 Alston 'Does God have beliefs?', 290.
36 Ibid.
37 Ibid., 291.
38 Alvin Plantinga, 'How to be an anti-realist', *Proceedings and Addresses of the American Philosophical Association,* 56 (1982), 70.
39 For an interesting version of this argument, see William F. Lawhead, 'The symmetry of the past and the future in the *kalam* cosmological argument', in William Lane Craig and Mark S. McLeod (eds) *The Logic of Rational Theism: Exploratory Essays* (Lewiston/Queenston/Lampeter: The Edwin Mellen Press, 1990), 99–111. See also Erik Sotnak 'The kalam cosmological argument and the possibility of an actually infinite future', *Philo,* 2 (1999), 41–52.
40 See William Lane Craig *Divine Foreknowledge and Human Freedom* (Leiden: E. J. Brill, 1992), 288, n. 12. See also *idem* 'Classical apologetics', in Steven B. Cowan (ed.) *Five Views of Apologetics* (Grand Rapids MI: Zondervan, 2000), 50–51, n. 27.
41 William Lane Craig *Time and Eternity: Exploring God's Relationship to Time* (Wheaton IL: Crossway Books, 2001), 99.
42 Craig *A Classic Debate on the Existence of God.*
43 Ibid.
44 See Tooley *A Classic Debate on the Existence of God.*
45 Ibid.
46 Ibid.
47 Craig 'Classical apologetics', 52.
48 This is so, despite the fact that I have scant acquaintance with the textbooks in question! I will leave it to others to determine whether I am a 'normal adult'.
49 I want to thank Barbara Morriston for listening to me read countless different versions of various parts of this paper, and saving me from countless errors.

5

On the Beginning of Time: A Reply to Wes Morriston Concerning the Existence of Actual Infinities

Andrew Loke

1 Introduction

Wes Morriston is one of the most vigorous contemporary critics of the *kalām* cosmological argument (KCA). In this chapter, I shall respond to his objections to the philosophical argument for the beginning of time based on the impossibility of (concrete)[1] actual infinities.[2]

2 Is There a Non-Question-Begging Argument Against an Actual Infinite Past?

The argument as formulated by its most noteworthy contemporary proponent, William Lane Craig, is as follows:

1. An actual infinite cannot exist.
2. An infinite temporal regress of events is an actual infinite.
3. Therefore, an infinite temporal regress of events cannot exist (Craig and Moreland 2009, 103).

For premise 1, Craig has argued that the absurdities which result from paradoxes such as Hilbert's Hotel show that actual infinities cannot exist. Morriston (2002: 154–55) objects that many of the supposedly "absurd" implications are so only because they appear to violate Euclid's axiom that the number of elements in a set must be greater than the number of elements in any proper subset of that set. On the basis of Cantor's theory of transfinite numbers, friends of the actual infinite might say that Euclid's axiom holds only for finite sets, in which case it will be difficult for Craig to come up with an objection that does not beg the question against them.

Additionally, Morriston argues that, even if successful, the argument from Hilbert's Hotel would only entitle one to conclude that actual infinities with elements that coexist

and bear a changeable physical relationship to one another cannot exist. However, events in a temporal series do not coexist according to the dynamic theory of time; rather they exist one after another. Furthermore, events in a temporal series cannot be changed, "manipulated," or removed in a manner analogous to checking people out of hotel rooms. Past events are not movable (Morriston 2002: 148–49; 2003: 296–97; 2013: 23). While Craig has claimed that "infinity minus infinity" entails logically impossible situations, Morriston (2002: 152) objects that there is no contradiction; the result is simply left undefined according to Cantor's theory.[3]

Nevertheless, an appeal to Cantor's theory by no means proves that concrete actual infinities are possible. It should be noted that what is mathematically possible is not always metaphysically possible. For example, the quadratic equation $x^2-4=0$ can have two mathematically consistent results for "x": 2 or -2, but if the question is "how many people carried the computer home," the answer cannot be "-2," for in the concrete world it is metaphysically impossible that "-2 people" carried a computer home. Thus the conclusion of "2 people" rather than "-2 people" is not derived from mathematical equations alone, but also from metaphysical considerations: "-2 people" lack the causal powers to carry a computer home. This shows that metaphysical considerations are more fundamental than mathematical considerations (Loke 2016c: 265).

In relation to this, I have argued in Loke (2012, 2016c) that certain kinds of concrete infinities such as an actual infinite past are impossible because they would lead to a violation of a metaphysical necessary truth. Suppose there is a "Christmas present generator" which has been generating similar Christmas presents at fixed temporal intervals as long as time existed. Suppose there is also a "person generator" which has been generating persons at the same fixed temporal intervals as long as time existed. Suppose that the presents and the persons continue existing after they have been produced. I argued that the presence or absence of leftover presents should be independent of each person grabbing one present produced at any particular instant, because (P) each person grabbing one present from one temporal position rather than another has no causal power with respect to the presence of leftover presents.

It is uncontroversial that P is metaphysically necessarily true for finite sets. The crucial question to ask is whether P is metaphysically necessarily true only for finite sets, or is it metaphysically necessarily true for "any set with any number of concrete members" that can exist. I argued that it is a metaphysically necessary principle that the causal powers of a set of things ultimately depend on the things in the set and not the number in conjunction with the things. For example, suppose that a certain thing Z has zero mass. In this case, either a set of "twenty" or "ten" Zs would not make a difference to the reading on the weighing scale, because $20 \times 0 = 0$ and $10 \times 0 = 0$. And in cardinal arithmetic of Set Theory, infinity $\times 0 = 0$, because the product of any set A with the empty set is the empty set.[4]

The point is that whether a set of things has a certain causal power or not ultimately depends on the things (in the case of the Christmas present scenario, a thing= "each person subsequently grabbing one present from one position rather than another"), and not the number in conjunction with the things (Let us call this metaphysical fact F. It should be noted that this metaphysical fact is not based on whether a concrete

infinite can exist or not; rather it is based on the abstract nature of numbers. Hence, this metaphysical fact does not beg the question against concrete infinities). "Number" is a mere abstraction of the things that exist in the set, and the "number" of a set of things is not the sort of entity which in conjunction with the things in the set would have certain causal power that the things would not have had. Since that is the case, it cannot be claimed that the *abstract number n* (whether finite or infinite) of person-present in conjunction with "each person subsequently grabbing one present from one position rather than another" would make a difference concerning the presence or absence of causal power with respect to leftovers.[5] Rather, the presence or absence of such causal power would ultimately depend on whether "each person subsequently grabbing one present from one position rather than another" has any causal power, and the abstract number *n* would be irrelevant.

Hence, the number of physical things in a set should not matter where the range of P over *z* is concerned. Now we know that P ranges over any *z* where *n* is finite (both friends and opponents of infinity are agreed on this). However, since *n* is irrelevant, it is not the case that P ranges over any *z* only where *n* is finite; on the contrary, it is the case that P ranges over any *z* for any *n*. Hence, P is metaphysically necessarily true, not merely "for finite sets," but for "any sets with any number of members" that can exist.

I explained that P will be violated if there were an actual infinite past: suppose at time t_0 the person who was generated at t_{-1} picked up the present generated at t_{-1}, the person who was generated at t_{-2} picked up the present generated at t_{-2}, the person who was generated at t_{-n} picked up the present generated at t_{-n} . . . If there were an infinite temporal regress of events, the result is that there would not be an infinite number of presents left. But if they had grabbed the presents this way: the person who was generated at time t_{-1} picked up the present generated at t_{-2}, the person who was generated at t_{-2} picked up the present generated at t_{-4}, the person who was generated at t_{-n} picked up the present generated at t_{-2n} . . . If there were an infinite temporal regress of events, what happens is that each person would walk away with one present, and there would be an infinite number of presents left! The problem arises from the postulation of an actual infinite past, for if the generators, persons and presents did not exist from an actual infinite past, such situations which violate metaphysical necessity truth P would not have arisen. Hence, an actual infinite past is metaphysically impossible.

It is important that neither the opponent nor friend of infinity should beg the question in the dialectic. On the one hand, it should be noted that "entailment" is different from "basis": while metaphysical fact F entails the rejection of concrete infinities, it is not based on the rejection of concrete infinities. Rather it is based on the independent reason that numbers are causally inert in the sense explained above. My argument is not based on the presupposition that concrete infinities cannot exist, which would be begging the question. Rather, my argument is based on the independent reason that numbers are causally inert, and therefore does not beg the question. On the other hand, a friend of infinity should not beg the question by simply asserting that, "concrete infinities do not obey P, therefore the argument is fallacious." For to argue that way would be to presuppose that concrete infinities can exist, which is precisely what is being denied by the opponent. A friend of infinity should also not simply say "Infinite collections behave

differently from finite collections." Of course, infinite collections (if they exist) could have properties that are different from finite sets, but the problem is that certain infinite collections would have properties that violate metaphysical necessity if they were to exist in the concrete world; therefore they cannot exist in the concrete world but only in the abstract realm (see Sections 3 and 4). Additionally, a friend of infinity should not simply claim that, "it is unproblematic that there could be causal capacities present in infinite collections that are not present in finite collections, thus if metaphysical fact F entails the rejection of this unproblematic claim, then it would be question-begging to insist on metaphysical fact F in this context." For to claim that "it is unproblematic that there could be causal capacities present in infinite collections that are not present in finite collections" would be to beg the question against the opponent who argues that this claim is problematic, on the basis that it violates the metaphysical principle that whether a set of things has certain causal power or not ultimately depends on the things.

In short, a friend of infinity should not beg the question in the dialectic by merely presupposing that concrete infinities can exist, and insists that the entailment of violation of P by a concrete infinite serves as a counter-example to the opponent's argument. Rather, she would have to rebut the independent reason the opponent offers as the basis for the opponent's argument, and the independent reason in this case would be the fact that numbers are causally inert in the sense explained above. To rebut this, a friend of infinity might try to argue that an actual infinite number does have independent causal powers. However, it is evident that numbers do not have causal powers; numbers do not—apart from the concrete particulars that they are of —bring about the existence of, say, minds, babies, universes. To claim that an actual infinite number has causal powers such that it can actually produce infinite leftovers by acting on the persons' actions in grabbing the presents from certain positions, which otherwise do not have causal power with respect to leftover presents, is really to claim that such numbers are concrete particulars with highly active causal powers of their own. If this claim were true, such a number would not be abstract anymore; rather it would be something that is concrete and existing alongside the sets of presents and people! But of course, numbers are not concrete particulars which exist alongside the concrete particulars that they are of.

3 Are there counter-examples in the abstract realm and in space?

Against Craig's first premise, Morriston (2002: 156) claims the existence of an actual infinite number of abstract entities as a counter-example, and he asks what is the relevant difference between the abstract mathematical reality and concrete reality where actual infinities are concerned. Morriston argues that Craig's conceptualist attempt to deny the extra-mental existence of an actual infinite number of abstract entities and to locate them in the mind of God is unsuccessful, for "it seems that many of the paradoxes Craig finds so objectionable can still be generated inside God's mind" (157).

In reply, my Christmas present scenario indicates that the problem with certain kinds of concrete infinities is related to the fact that the members of the set are embedded in a network of causal relations *and* which involve the violation of metaphysical necessary truth. Since an actual infinite of abstract entities are not embedded in a network of causal relations and do not involve such violations, the realm of abstract objects is exempted. By making this sort of moves, proponents of KCA can allow for the existence of an actual infinite number of extra-mental abstract entities, but argue that an actual infinite past does involve such a violation and thus is metaphysically impossible. By accepting Platonism, proponents of KCA can avoid locating abstract entities in the mind of God, and argue that the violation of metaphysical necessary truth does not occur inside God's mind which knows the whole of reality by way of a single undivided intuition (see further, Loke 2016c).

Morriston (2002: 162) has argued for the existence of concrete infinities in space by claiming that one could come up with a specification relative to which the number of coexistent subregions of a given region of space R is actual infinite, for example, "starting with R, divide the results of the previous division by half ad infinitum," and that we do not need to complete the series of divisions in order to know that, relative to this rule, there is an actual—and not merely a potential—infinity of subregions.

In reply, proponents of KCA can reply to Morriston's Rule by arguing that an actual infinity of subregions exists only as an abstraction which we conceive relative to this rule, but an actual infinity of subregions does not exist concretely in space itself. Rather the series of divisions that is actually completed as well as the number of subregions that result in the concrete world is always finite (Loke 2016a).

Morriston (2002: 163) argues that, even if space is not in fact Euclidean, it seems obvious that it could have been and that there are possible worlds in which parallel straight lines never meet and in which finite straight lines can be extended indefinitely, and in which space is actually infinite. However, proponents of KCA can argue that the Christmas present scenario indicates that there are in fact no such possible worlds, and that what "seems obvious" (e.g., parallel straight lines which never meet and which extend indefinitely) merely refers to abstractions which cannot be realized as concrete entities.

4 Does the argument rule out an endless future?

Morriston (2010, 2013, forthcoming) objects that if Craig's argument against the possibility of the actual infinite based on paradoxical implications (as illustrated by Hilbert's Hotel) worked as advertised, it would not only rule out a beginningless series of past events as Craig intended, but it would also rule out an endless series of predetermined future events, which seems inconsistent with Christian Eschatology. Morriston proposed a thought experiment featuring a pair of angels to illustrate his point:

> Suppose that God has just decreed that Gabriel and Uriel will take turns praising Him for one minute of celestial time, and that they will do so forever. Gabriel will do the odd-numbered praises and Uriel the even-numbered ones. Let's go a step

> further. So as not to leave any opportunity for Gabriel or Uriel to mess things up, let's suppose that this is no mere instruction or recommendation, but that God has exercised His supreme power in such a way as to make it the case that each praise in the endless series of praises we have envisaged will occur. Each of them is discrete, wholly determinate, and certain to occur because God has determined that it will occur. . . . If you ask, "How many distinct praises will be said?" the only sensible answer is, "Infinitely many." (Morriston 2010: 443)

Morriston claimed that he can derive the same sorts of allegedly absurd implications that friends of the KCA claim to be able to derive from a beginningless series of events, as follows:

> God could instead have determined that Gabriel and Uriel will wait a celestial minute after each pair of praises, thus making "room" for infinitely many more praises by a third angel—Raphael, say. Infinitely many praises by Raphael are "added," and the praises of all three angelic beings will be said in the same (infinite) amount of time. That's absurd. . . . God could instead have determined that Gabriel and Uriel will stop after praise number four. Infinitely many praises would be prevented, and the number of their future praises would be only four. Alternatively, God could have determined that Gabriel be silent during all the celestial minutes between Uriel's future praises. In this case too, infinitely many praises would be prevented, but the number of future praises would instead be infinite. That shows that your infinite future praise scenario has inconsistent implications. (ibid.: 444)

In response to Craig (2010), who replied that, on an dynamic theory of time, the series of praises that will be said by either (or both) of the angels in Morriston's scenario is merely potentially infinite, Morriston argues,

> Craig is certainly right about one thing. The number of praises that have been said by the angels in my scenario will always be finite. Right now, the number is zero. Once the praising has begun, the collection of praises that have been said will increase without limit (or, as Craig prefers, "toward infinity as a limit"). But I was not asking for the number of praises that have been said. Instead, I was asking for the number of praises yet-to-be-said—that is, for the number of praises, each of which will eventually be said. In the world of my thought experiment, the series of praises yet-to-be-said is not growing, is never finite, and does not satisfy Craig's definition of "potentially infinite." (Morriston forthcoming: 3)

Morriston also argues that Craig's reply does not escape from the fact that in his scenario each of the future praises is predetermined in such a way that it cannot fail to be actualized. He argues that in his scenario, it must be true that

> G. For every odd number *n*, Gabriel will (eventually) have said the *n*th praise in the series of praises that have been said.

> U. For every even number *n*, Uriel will (eventually) have said the *n*th praise in the series of praises that have been said.
>
> From this, Morriston concludes that, "even if 'there are' no future events, there is still a one-to-one correspondence between the natural numbers and the tensed truths in various relevant series." (ibid.: 6)

Morriston goes on to argue, among other things, that Platonism with respect to propositions is irrelevant ("I do not think I need to take a stand for or against Platonism"), and reaffirms his original conclusion that an endless series of predetermined praises will have the paradoxical implications that Craig finds so absurd (ibid.: 12).

In the assessment of the exchange between Craig and Morriston, I have argued in Loke (2016b) that, contrary to Morriston, the issue about abstract objects is not a "side-show," but rather it is of importance for addressing Morriston's counterargument based on the number of praises yet-to-be-said.

As explained earlier, proponents of KCA can hold the view that his argument is directed against concrete infinities and not abstract infinities; they can accept Platonism and also allow for an actual infinite number of abstract entities, including propositions. They can claim that distinguishing between abstract infinities and concrete infinities is of great importance. After all, mathematicians play around with abstract infinities all the time. For example, if an infinite number of members are removed from an infinite set, one can get a null set, but one can also get other sets too, depending on how the members are removed. It is because of metaphysical problems related to this— as illustrated by the "absurdities" of Hilbert's Hotel, for example— that proponents of KCA think that abstract infinities cannot be instantiated in the concrete world. Nevertheless, as long as the problems remain in the abstract, that is fine, and mathematicians (as well as philosophers such as Morriston) can continue to play around with them.

Having made the point that argument against the possibility of the actual infinite based on paradoxical implications is directed against concrete rather than abstract entities, proponents of KCA can reply to Morriston as follows: The number of praises yet-to-be-said—that is, the number of praises, each of which will eventually be said—is infinite, but the number of praises yet-to-be-said do not yet exist as concrete entities or events. Nor would it ever be the case that all of them have been actualized as concrete entities or events, for no matter how many praises have been said, an angel could still say one more. As noted earlier, Morriston agrees that "the number of praises that have been said by the angels in my scenario will always be finite" and that "the collection of praises that have been said will increase without limit." One might think it absurd that an actual infinite number of praises will never be said even though each of the praises will eventually be said, but given that "the praises that will eventually be said" do not yet exist as concrete entities or events, this is a problem that remains in the abstract and does not cause problem in the concrete world.

It is true that in Morriston's scenario each of the future praises is predetermined in such a way that it will eventually be actualized, that is, it is true that "(G) for every odd number *n*, Gabriel will (eventually) have said the *n*th praise in the series of praises that

have been said" and "(U) for every even number *n*, Uriel will (eventually) have said the *n*th praise in the series of praises that have been said." Nevertheless there will never be a time at which all of the future praises are or have been said, and hence never a time at which there is or have been an actual infinite of concrete entities or events. Morriston claims that there is still a one-to-one correspondence between the natural numbers and the tensed truths in various relevant series. However "tensed truths" are abstract rather than concrete entities.

With respect to God's knowledge of the number of praises that will be spoken, Morriston notes that Craig has suggested that God knows the whole of reality (including the future) by way of a single, indivisible intuition. Morriston objects that this tells us nothing about how he knows the future (Morriston forthcoming: 10–11). In reply, the fact that Craig has not explained the mechanism by which God knows the future does not imply that his suggestion is false. On the contrary, given the limitation of human cognition we should not be surprised that we have not figured out the divine mechanism by which God knows things, or that we could not do so. Hence Morriston's objection is not an adequate reason for rejecting Craig's suggestion. Morriston also objects that Craig's suggestion does not solve the problem at hand. Morriston claims that as long as propositions (G) and (U) are true—as long as each of them would, if abstracted from the object of God's "undivided intuition," have the same standing as Mars has two moons—it will be easy to do the counterfactual variations on his imaginary angelic praise scenario that drive his original argument (ibid.: 11–12). In reply, Morriston seems to have failed to observe that the truths of these propositions abstracted from the object of God's "undivided intuition" remain as abstract entities and that unlike the two moons of Mars which exist as concrete entities, the number of praises yet-to-be-said does not exist as concrete entities.

In his earlier paper, Morriston (2010: 449–50), in preemptive fashion, suggested that Craig might perhaps require that the members of the collection be concrete rather than abstract, but he claimed that one can still derive the same sorts of allegedly absurd implications that friends of the KCA claim to be able to derive from a beginningless series of events, and thus in the present context this is a matter of no consequence. In reply to this potential argument, as noted above, Morriston maintains that one cannot derive the same sorts of allegedly absurd implications, because in Morriston's scenario the infinity of actual events (i.e., praises said by the angels) involved is merely potential and the number of events that happen will always be finite. There will never be a time at which infinitely many praises by Raphael have been said and are actually "added" to the praises said, and while the number of praises yet-to-be-said by Raphael is infinite, these do not exist as concrete entities or events, nor would it ever be the case that all of them have been actualized as such. The problem that "infinitely many praises by Raphael are added and the praises of all three angelic beings will be said in the same (infinite) amount of time" remains in the abstract, and hence they do not cause problems in the concrete world. Again, there will never be a time at which infinitely many said praises would have been prevented, for example, by God determining that Gabriel and Uriel stop after praise number four or that Gabriel be silent during all the celestial minutes between Uriel's future praises. While the number of praises

yet-to-be-said and prevented is infinite, they do not exist as concrete entities or events. Once again, the problem remains in the abstract; that does not cause problems in the concrete world. On the other hand, the implications that proponents of KCA claim to be able to derive from a beginningless series of events concern actual events that have happened, and which would cause problems in the concrete world. Therefore, the claim that one can derive the same sorts of allegedly absurd implications is false, and hence it is not an adequate justification for thinking that "the requirement that the members of the collection be concrete rather than abstract" is a matter of no consequence.

In conclusion, contrary to Morriston, an endless future series of predetermined events and a beginningless series are not in the same boat. There cannot be a beginningless past, but there can be an endless future in which angels and humans sing the praises of God forever.

Notes

1 As explained below, my argument is slightly different from Craig's in that it does not rule out the existence of abstract actual infinities, but only certain kinds of concrete infinities such as an infinite past.

2 Due to limitation of space, I shall not respond to Morriston's objections to the other philosophical argument for the beginning of time based on the impossibility of traversing an actual infinite. For my assessment of this argument, see Loke (2014).

3 Likewise, mathematician James East (2013) has objected that according to Cantor's theory inverse operations of subtraction and division with infinite quantities do not lead to contradictions; they only lead to indefinite answers as one could get different answers depending on which objects one chooses to take away.

4 Infinity x 0 is not equal to 0 if we are talking about infinity as a limit, but the concept of infinity as a limit is not relevant here; what we are discussing here concerns a set of entities, and thus we should be talking about infinity as understood in set theory rather than as a limit.

5 Peter Lyth claims that my argument conflates number as a number of events or things with number as an abstract entity (Lyth 2014: 85–88). This claim is false, because "number" is understood in the same sense throughout the argument, that is, as an abstract entity with no independent causal power.

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No Beginning, No Explanation: The *Kalām* Cosmological Argument and the Principle of Sufficient Reason

David S. Oderberg

1 Introduction

A number of years ago, Wes Morriston and I had a vigorous and interesting exchange about the possibility of a beginningless past.[1] Morriston covered a wide terrain, including Hilbert's Hotel (a paradox about actual infinity), Euclid's Maxim (the whole is greater than its parts), inverse operations on transfinite numbers, and the infinite future. Needless to say, he finds the many arguments against an infinite past, championed most prominently by William Craig, to be unconvincing.

Morriston also devoted a substantial portion of his talk, subsequently revised and published in 2003,[2] to what I thought then,[3] and continue to think, is one of the strongest arguments against the possibility of an infinite past. This is the *a priori* argument that an infinite past would violate a highly plausible version of the principle of sufficient reason (PSR)—an argument distinct from other *a priori* arguments against the very idea of an actual infinity, or against the "traversability" of the infinite. Again, Morriston is not at all convinced by an appeal to the PSR, nor are other prominent critics of the *kalām* cosmological argument (KCA).[4] In what follows, I will set out and elaborate the line of argument I took then and continue to espouse. Perhaps the critics will, as a result, be willing to reconsider their opposition to the use of PSR in this context.

2 An initial warm-up

In the *Philosophical Remarks*, Wittgenstein has a well-known passage in which he asks us to imagine "a man whose life goes back for an infinite time and who says to us: 'I'm just writing down the last digit of *pi*, and it's a 2'. Every day of his life he has written down a digit, without ever having begun; he has just finished." Wittgenstein takes the scenario to be absurd on its face, adding immediately: "This seems utter nonsense, and a *reductio ad absurdum* of the concept of an infinite *totality*."[5]

Note that Wittgenstein's scenario is a little off base even in this recondite area of thought experiments about the infinite. His writer has lived forever in the past *and* claims to be writing down the last digit of *pi*. For Wittgenstein's purposes, he might as well have lived for a *finite* time and claimed to write down the last digit of *pi*, since Wittgenstein's problem seems to be with an infinite totality *tout court*: *pi* is irrational, so how could you write down its last digit whether or not you have lived eternally in the past?

Still, Wittgenstein might have had a more specific worry, one that he could equally forcefully have posed using a sequence that *does* have a last element. For he is reported by Jonathan Bennett to have told Anscombe[6] that we would find it preposterous were we to come across a man claiming to have been counting the decimal expansion of *pi backward* from eternity and to be finishing the job before our eyes by reciting: "9, 5, 1, 4, 1, 3—finished!" We are not told exactly what might have worried Wittgenstein about the scenario, but Bennett himself finds it "creepy,"[7] locating the creepiness in the fact that to suppose myself to *have performed* an "infinite series of operations is to suppose myself to be, now, infinitely experienced, or endowed with an infinite stock of memories, or something of that kind"[8]—which Bennett finds unintelligible.

I prefer not to see in this sort of thought experiment a problem about having an infinite stock of memories, since what worries me about it obtains even if the backward counter (BC) has the capacity to remember an infinite amount of information, in which case Bennett's diagnosis does not generalize. My concern is precisely that of Craig, who poses a similar thought experiment—the BC who appears before us saying, "-5, -4, -3, -2, -1—done!" and informs us he has just finished counting the negative numbers backward from an infinite past. As Craig puts the worry on several occasions,[9] if the BC finishes on, say, Saturday, why didn't he finish the day before, on Friday—or a week before, or a year before, or a million years before? What explanation could there be for finishing on any particular day rather than another? Yet doesn't finishing at a particular time *require* an explanation?

3 Always finished?

Before we get to the heart of the problem—whether the BC violates the PSR and whether, if so, the same applies to the possibility of an infinite past—I want to consider an initial objection to the idea that the BC scenario is problematic, as both Craig, I, and other defenders of the KCA believe. Morriston's opening gambit is to assert that Craig confuses having counted an *infinity* of negative numbers with having counted *all* the negative numbers up to zero. This is in response to Craig's claim that the BC cannot finish at any particular time because he would have *already* finished *before* that time, whichever putative finishing time we propose. As Craig puts it:

> The fact is, we could never find anyone completing such a task because at any previous point he would have already finished. But what this means is that there could never be a point in the past at which he finished counting. In fact, we could

> never find him counting at all. For he would have already finished. But if no matter how far back in time we go, we never find him counting, then it cannot be true that he has been counting from eternity.[10]

The argument seems to be as follows:

1. Suppose the BC finishes at some time *t*.
2. But then he would already have finished at some earlier time *t–1*.
3. But if he has already finished at *t–1*, he did not finish at *t*.
4. So, by reductio:
5. The BC did not finish at *t*.

The argument is wholly general for any *t*, so the BC can never be finished. In fact, this argument can be traced back to Dretske, who also objected to the BC that "he is not (just) finishing the job—he was *always* finished. For no matter how far back we go in time, only a finite number of numbers remain to be counted; and this means that he has already counted an infinite number of them."[11] Dretske's justification is implicitly identical to Craig's, since Craig relies on "Hume's Principle": if sets can be put into one-one correspondence, they are "equivalent." And if they are equivalent, they have the same number of members. The defender of BC holds that the task can be finished, since the negative numbers can be put into one-one correspondence with relevant past times. If, say, the BC counts one negative number per day, the numbers can be put into one-one correspondence with days; since there is an available day for every number, and a number for every day, the BC can complete the task.

Now Morriston, agreeing with Sorabji[12] (among others), argues that it is in virtue of conflating the counting of *all* the negative numbers with counting an *infinity* of them that Craig thinks the BC will have finished at all times and hence will not have finished at all. The BC only counts all the negative numbers when he gets to −1; when he gets to −2, or any number less than −1, he will have counted some infinite series of negative numbers that is a proper subset of the entire set. But he will not have counted them *all*. I submit that Craig is right about this and that Morriston and Sorabji are mistaken, but I can also see why they were tempted into the mistake. For if the argument is formulated as (1)–(4) above, it is indeed open to the critic to reply as follows: *if* the BC finishes at *t* he would *not* have finished at any earlier time since for any earlier time, a one-one correspondence could only be made with a proper subset of the negative numbers. At any earlier time he would, to be sure, have counted an *infinity* of negative numbers but he would not have counted *all* of them.

The temptation to reply this way is due to construing Craig's argument as (1)–(4); but we should not construe it that way. Specifically, we should not take Craig's argument as starting from the categorical assumption that the BC finishes at *t*. Rather, we should modalize the assumption: assume that the BC *could* finish at *t*. We then get what seems to be the best way of stating Craig/Dretske's admittedly ambiguous objection:

1)* Suppose the BC could finish at some time *t*.
2)* But then he could finish at some earlier time *t–1*.

3)* But then there is no reason why he should finish at *t–1* rather than *t* or vice versa. So (given the generalizability of the premises)
4)* There is no reason why the BC should finish at any time.

Now if it is right that if there is no reason why something should happen at any time then it cannot happen at any time, we can further conclude that the BC cannot finish at *t*, contra 1)*. And that further assumption is precisely where the PSR comes into play. In other words, the Craig/Dretske objection, as stated by them, leaves room for their critics to refute it. But Craig (and Dretske) should not have stated the objection in a way that left that room. More precisely, Craig should not have treated the objection as *separate* from the objection appealing to the PSR. In fact, the "always finished" objection, as we might call it, just *collapses* into the objection from the PSR. Hence Morriston's reply to the Craig/Dretske objection ends up being beside the point.

4 The objection from the Principle of Sufficient Reason

The kind of PSR objection that I claim to be insurmountable for the defender of a beginningless universe is the one raised by Craig and to which Morriston devotes substantial attention: What explanation could there be for the BC's finishing at *any* particular time, assuming he could finish at all? After all, as Craig puts it, "an infinite time had already elapsed, so that he has had ample time to finish."[13] So if the BC *could* finish at *t*, then given that an infinite amount of time has already elapsed, he *could* also have finished at *t–1* or any time at all prior to *t*. But there would be no explanation why he *should* finish at *any* particular time. In other words, were he to finish at *t* there would simply be no explanation for it.

We do not have to make many assumptions to find a version of PSR that is minimally sufficient to ground the "no explanation" objection. We need not assume there to be only *one* privileged version of PSR. Nor need we assume a version that requires an explanation for any *maximal* truth, fact, event, and the like (such as the conjunction of all truths, or of all contingent truths, or of all (contingent) truths at some time). We need not assume a version that requires a reason for necessary truths either; hence we need not assume a version that requires an explanation of every truth, fact, event, and so on, or a version that requires a *complete* or *fully adequate* explanation for anything.

That I do not make assumptions concerning either maximal truths or complete explanations means that the present analysis completely bypasses criticisms of "strong principles of sufficient reason" given by Graham Oppy.[14] In any case, Oppy has an implausible view as to how a complete explanation functions: he thinks it must "necessitate" the explanandum, in which case if there is "libertarian freedom," then "free actions of free agents" must lack a sufficient reason.[15] What he means by "necessitates" is unclear: on the one hand he seems to mean entailment: "If it is possible to have A and not B, then A alone can be neither a full explanation for nor a sufficient reason for B."[16] On the other, he seems to mean something like "make necessary," hence his reference

to free actions—which are eo ipso not necessary and so violate "strong" principles of sufficient reason. It is a mystery why anyone should think a complete explanation has to entail what it explains: Why can't it simply do the job of making what it explains fully *intelligible*, so we understand *why* it happened and with no remainder unexplained? Further, if the explanation is itself contingent in the sense of consisting, for instance, of some contingent state of affairs, in no way will it ever make the explanandum *itself* necessary. So if, say, the Big Bang (perhaps conjoined with the laws of nature as they are now, whether contingent or necessary) were a complete explanation of why the universe is as it is right now, and the Big Bang is contingent, the way the universe is right now cannot be necessary. The plausibility of this scenario is matched by the implausibility of Oppy's understanding of complete explanations.

In short, all we need is a fairly weak version of PSR along the following lines:

> PSR: Every nonmaximal contingent fact *F* has at least a partial explanation of its obtaining rather than any of the alternative facts *G,H,I* . . . that could have obtained instead of it.

In limiting this version of PSR to the realm of the contingent I broadly follow Alexander Pruss,[17] who also restricts the PSR to contingently true propositions. For present purposes I make no judgment as to whether any stronger principle can or should be defended.

I claim that if anything is self-evident, it is self-evident that the BC violates the PSR. There can be no explanation, no *reason*, why the BC finishes at any particular time. Yet if *this* sort of contingent fact needs no explanation, whatever does? If such a fact—finishing at *this* time rather than *that*—would have no reason, how could it ever obtain? If any contingent fact requires an explanation, this does. Of all the kinds of contingent fact covered by the PSR, it is hard to think of a fact more in need of a reason than this. Moreover, it is not merely that there is no complete or adequate reason for such a fact—the particular finishing time—but that there could be no reason *at all*, not even a *partial* one. To appeal to Hume's Principle is of no avail: if that gives the critic anything, it is only a possible explanation of why the BC finished. But it can never furnish a reason for the BC's finishing *at any particular time*.

Applying the BC scenario to the case of the universe considered as a series of events stretching back into the past, the lack of explanation is no less apparent. Pick some nonmaximal state *S* of the universe as it is now—say, the heat distribution throughout the universe such that the average right now is 2.735 Kelvin, or the distribution of some set of particles throughout some portion of space right now. What explanation is there for the universe's being in state *S right now*? Or to put the question in more vivid terms: Why, for instance, did *S* not obtain yesterday, or three thousand years ago or a billion years ago?[18] For any such state, we can surely ask: Why is it like *this* right *now*? It *could* have been like this at some other time. So why does *S* obtain at this particular moment in the history of the universe rather than at some other? I cannot see even a partial explanation for this, on the assumption of a beginningless universe, any more than in the case of the BC.

5 Turning the problem back

Later, I will expand on my restriction of PSR to *partial* explanations of nonmaximal contingent truths, since important questions are raised by these qualifications. First, though, I want to take up Morriston's objections roughly in the order in which he makes them. Note that he does not consider my version of PSR or any other particular version. None of his objections disposes of the argument from the PSR, as I formulate it, against the possibility of an infinite past. The first involves the attempt to turn the problem back onto his opponent:

> The proper response to the question why the counter wouldn't finish "next year or in a hundred years" is not to say, "Because infinitely many numbers can already have been counted by now." It is rather to turn the question back at Craig, and ask why the count should not be ending now. Why should it end later than now? No doubt there could have been a beginningless count ending in zero "next year or in a hundred years." But it does not follow that there cannot also be one terminating in the present. Certainly, Craig cannot show that a count ending in zero now is not possible merely by arguing that one ending in zero next year would also be possible.[19]

This will not do. Again, there is some room for possible misunderstanding of the argument given the way Craig presents it. Once we understand it correctly, this sort of objection falls away. It is not that the BC "should" have finished at some time other than the hypothetical time *t* at which we assume him to finish. Morriston cannot help himself to the thought that "no doubt" BC could have finished at other times. The argument is *not* that a backward count ending at some other time is possible; so the objection that this does not imply that the BC could not finish at *t* is wholly beside the point. Rather, the argument is that *no* such count is possible because there is no explanation for finishing at any particular time, hence no explanation for finishing at all. I do not *assume* that the BC finishes at some time *t*; I merely assume that he *could* in order to show that he *couldn't*.

6 Assuming a particular model of time and events

Morriston's next point is that the question behind the argument from the PSR assumes a certain metaphysical model of the relation between time and events. The model consists of a substantivalist theory of time whereby there is one temporal series and a distinct series of events, be they events of backward counting or, more relevantly, events in the history of the universe (or a series of subcosmic states). The question he puts in the mouth of his opponent is, then: Why do the events in the event series map onto the times in the temporal series in the way that they do?[20] If, on the other hand, we believe that "the flow of (dynamic) time just *is* the continual happening of events, and

the past just *is* the series of events that have already happened," the question "Why does the series of *events* end at this time rather than some other" becomes as empty as the question "Why does the series of *times* end with this time rather than some other?"[21]

The force of the question as to why the series of events finishes at some particular time rather than another does not, I contend, depend on any particular view about the nature of time. Our best current science tells us the universe is about 13.7 billion years old, based on a calculation of such things as distances to the furthest galaxies we can observe and the rate of expansion of the universe. Changes in any of the relevant values would produce the measurement of a younger or older universe. We can understand how this works without committing ourselves to any particular view of the metaphysics of time: we have all the material we need both to calculate and to speculate from within "the series of past events," to use Morriston's term. Yet Morriston thinks that in order for the question to be raised as to why *S*—some nonmaximal state of the universe—obtains right now, 13.7 billion years (let's assume) after the Big Bang, we have to assume that the question is equivalent to the following: Why is the series of past events including *S* not *shifted* to some other position in "metaphysical time"? However, asserts Morriston, this model of the relationship between events and time is wrong. Yet if we can grasp the idea that the universe has a certain age simply by attending to events from *within* the universe, why shouldn't our question about *S* also be asked from the same vantage point? In other words, when I ask "Why does *S* obtain now rather than at some other time?" my question can be heard as one whose answer relies solely on the sorts of materials a Laplacean demon would employ[22]—facts about initial conditions and operative laws. If the universe does have a beginning, then we know the sort of computation that would in principle answer our crucial question about *S*, whether or not any finite human mind could even grasp it. We would have our explanation—whether partial or complete—based on a calculation of how the universe has developed in the 13.7 billion years since it came into existence. We would know that for *S* to have obtained at a *different* time, the universe would have to have developed differently—whether by virtue of being older, or younger, or of the operation of different laws given the actual age, or different initial conditions, and so on. We would have all that we need to answer our question, with no reference required to any "shifting" of events within the ontologically independent "series of past times." None of this is to say, of course, that there might not be *other* reasons for adopting a particular metaphysic of time, whether substantivalist, relationalist, or something else—only that nothing about our PSR-invoking question demands it.

7 A brute contingent fact?

Suppose, on the other hand, that Morriston is right that the question about *S* requires, for its intelligibility, an independent time series—and that there *is* such a time series. Why, he asks, might it not be a "brute contingent fact" that the series of past events maps onto the series of past times in the way it does? Why isn't the request for an

explanation in this case just as unanswerable as "stumpers" such as "Why is there anything at all?" or "Why *these* laws of nature?"[23]

Morriston remarks in passing that it would be odd for Craig to "assume without discussion or argument that brute contingency is impossible" because "one of the strengths claimed for the *kalām* argument is that it makes do with the weaker (and more widely accepted) principle that whatever begins to exist must have a cause."[24] Yet Craig's dialectical method, involving appeal to a weaker principle, hardly implies any concession that there may still be inexplicable contingent facts. In the present discussion I am appealing to a relatively weak version of PSR, minimally sufficient to make my point; yet I also think, without defending it here, that a stronger version of PSR is in fact correct. Moreover, as Pruss argues at length, the intuitions behind a causal principle of the kind Craig defends are precisely the intuitions that support a stronger PSR requiring all contingent truths to have an explanation.[25]

That said, should we take our question about *S* to be just another "stumper" like the questions of why there is anything and why we have the laws of nature we do? Needless to say, there is considerable room for belief that the latter questions are not "stumpers" at all but need a satisfying explanation as an answer, but let that pass. Is the question about *S* sufficiently like the other questions to be, even prima facie, a question in no need of an answer other than "that's how it is"? The PSR, in the form to which I am appealing or in a stronger form, has been controverted—but that does not make it "highly controversial."[26] To be sure, when it comes to questions such as the very existence of anything or the existence of the actual laws, it is relatively easy to see why application of the PSR might be resisted. To explain these phenomena requires going *outside* the universe, since nothing inside the universe could explain them. Everything within the universe[27] is governed by the laws, so how could anything with the universe *explain* why the laws are as they are? Even more acutely, how could anything that exists within the universe explain why anything exists at all? Note that I am leaving aside the highly dubious idea of anything contingent's being *self-explanatory*: in particular, to say that the BC's finishing at *t* rather than some other time is self-explanatory, or that *S*'s obtaining at *t* rather than some other time is self-explanatory, is to reduce the very concept of self-explanation to absurdity.

So Morriston's two alleged "stumpers" are tricky inasmuch as a potential explanation might take someone in a direction they really did not want to go—that of postulating some supra-cosmic power with the creative ability to make the universe and the laws within it. And of course there is plenty of serious discussion to be had about whether postulating such an entity would provide the needed explanation, or would result in some kind of incoherence, and so on. But when it comes to the question about *S*, we do not have to go outside the universe at all. We know exactly what a satisfying explanation would be: it would appeal to the very structure of the universe itself! That is, an intelligible, clear, satisfying explanation of *S*—and of our BC's finishing time—would appeal to the simple fact of the universe's having a beginning. Moreover, the explanation would cohere perfectly with everything we know from our best current science, as Craig has been at such pains to demonstrate from the time he began defending the KCA. Faced with an explanation in itself clear and effective, *and* that

tallies with our empirical knowledge, as against the prospect of a "stumper" that defies all explanation, sound philosophical method surely suggests the former.

Consider further, in support of my appeal to the PSR, that within the universe the question as to why certain events happen at certain times, or why certain states of affairs obtain at certain times, can have a perfectly intelligible answer[28] in terms of the tracing of events backward in time to a fixed point. At this stage I need to expand on the notion of partial explanation that is one of my qualifications to the PSR as formulated here. My principal claim is that *S*—the kinds of event or state mentioned earlier—has not even a partial explanation on the assumption of an infinite past, and so violates the minimal and highly plausible version of PSR enunciated above. An objector might contend, though, that my claim entails that *no* event or state of affairs within the universe has even a partial explanation, which seems absurd.

Consider the question: Why is this particular oak tree six feet tall on November 27, 2016, rather than reaching that height at some other time? It looks pretty clear that we have a partial explanation: because it grows at a certain rate, and we can trace its growth back in time to the point at which it started growing, thereby reconstructing the finite series of events or processes that led to its having that particular height at that particular time. Again: Why did billiard ball A strike billiard ball B at some particular time? The partial explanation is that we can trace back the events leading to the collision, reaching a fixed point (say, the striking of A by a billiard cue) from which we can reconstruct the events, using the relevant parameters of mass, velocity, position, and so on, that led to A's hitting B. There is nothing mysterious in this sort of reasoning. It would be perverse not to call these partial explanations of the relevant events and states. They are not *complete* explanations because a complete explanation would have to appeal to further events, states, processes, and the like, that occurred *before* the chosen fixed point—before the acorn began growing, before billiard ball A was struck by the cue. How far back do we need to go for a complete explanation? As far back as to include *every single* event, process, and the like, that had any causal relation whatsoever to the terminal event that we seek to explain—the tree's reaching that particular height at that particular time, ball A's colliding with ball B at that particular time.

Now, it is a corollary of my position that such events do *not* have complete explanations on the assumption of an infinite past. No nonmaximal event, state, and so on, *within* the universe has a complete explanation on the assumption of an infinite past. And I do think this is a serious problem for the idea that the past has no beginning. Nevertheless, I do not stake my claim on this ground, for otherwise I would need to appeal to a stronger version of PSR than my opponent, such as Morriston, would ever be willing to admit, namely that every (nonmaximal) contingent fact (event, state, etc.) has a complete explanation. Instead, I make my case by appeal to a *weaker* version of PSR sufficient to do the job: every contingent fact has at least a partial explanation. This is the principle I invite Morriston to accept.

One of the reasons for using the weaker principle is precisely that I can make a *contrast* between nonmaximal events that do have a partial explanation and those that do not. The oak tree's height at a time, the billiard ball collision at a time, both have

partial explanations, and they do so because we can trace the relevant processes back to a fixed starting point. By contrast, the sort of event, fact, state, and so on, to which I am appealing could not have even a partial explanation on the assumption of an infinite past. All we need to do is select nonmaximal events or states that are sufficiently similar to the BC scenario to make the point. I chose the current average temperature of the universe, or the distribution of some set of particles throughout the universe. Contrast these with, say, the state of the earth's currently having made 4.5 billion orbits of the sun.[29] This, too, has no complete explanation if the universe is beginningless, but it does have a partial explanation just as much as the height of the tree or the collision of the billiard balls. Just trace the relevant processes back to 4.5 billion years, to the first moment when the sun and earth coexisted and the earth began to revolve around the sun, add in the initial conditions and laws of nature, and we have a partial explanation of why 4.5 billion orbits have so far been made.

No events and states within the universe, if we look at it in Laplacean terms, have a *complete* explanation on the assumption of an infinite past. But partial explanations are inevitably selective, bringing in implicit assumptions about what we are interested in when we explain things. If I really want to know why the oak tree reached this height at this time, I will be satisfied if you tell me when it started growing and what its rate of growth was. I will not care about the causes leading to production of the acorn, or the causes of those causes, let alone whether the universe had a beginning. But that's just how partial explanations work: we select certain phenomena or portions of the whole that are objectively explanatory but nevertheless do not tell the whole story—only the story that we need for our purposes.

When it comes to *S*, however, we do not even have a *partial* explanation unless we posit a fixed point from which the path to *S* can be traced. This is because we need to consider events or states sufficiently similar to the BC—where it would be highly implausible to select some portion of the past series of events or states as a potential partial explanation. Imagine for a minute a BC scenario BC* in which the counter, when asked why he reached −1 on Saturday, replied: "Well, I have been reciting the letters of the alphabet in an endless loop from eternity—from *a* to *z,* then back to *a,* then to *z* again and again—and I finished this on the Wednesday before today, Saturday. Then from Thursday to today I have recited the negative numbers back from −3." With BC* we do have a partial explanation of why the counter reached −1 on Saturday, even if the past is infinite, namely that he started with −3 on Thursday. We select the portion of the recitation that is salient to us and use it as a fixed point for our explanation. Yet there is, or so I contend, no complete explanation.

The difference between the BC, where there is not even a partial explanation, and BC*, where there is a partial explanation, mirrors that between *S*, which might be the universe's reaching an average temperature of 2.73 Kelvin right now, or some set of particles reaching a certain distribution right now, and a state such as the earth's reaching 4.5 billion orbits of the sun right now. In the latter case, we can be selective and propose, quite plausibly, a partial explanation. But with *S*-type cases such as the two I am using, I am *presupposing* that there is no prior salient portion of the past series of events and processes leading up to *S* that can plausibly be selected

as a fixed point for a partial explanation. In the heat example, I am *stipulating* that the only series of events, states, and processes under consideration is a relatively homogeneous series involving the expansion of the universe and evolution of cosmic microwave background radiation. That's it—no salient fixed points at which one might cast about for a partial explanation of why we are at 2.73 Kelvin right now. In the particles example, I am *stipulating* that the only series of events under consideration is that involving the continual movement of particles—including those in the set whose terminal state we are seeking to explain, and any particles that have interacted with them in the past. Again, I am considering a spare, unvarnished series of movements and distributions over time, prescinding from questions concerning reductionism, composition, and the like. Just focus on the particles themselves and their movements—whatever they compose, if anything, and whatever salient events might be connected to them, such as planetary orbits. There is, I contend, not even a partial explanation of why the terminal distribution of the set under consideration is reached at *this* time rather than *that*.

8 Why not go maximal?

S-type events and states, I have argued, have not even a partial explanation on the assumption of an infinite past. My version of PSR invokes only partial explanation, but it also invokes only nonmaximal events and states. *S*-type events and states, as I have stipulated, are nonmaximal. But why not require maximal events and states *also* to have partial explanations? In other words, why not expand *S*-type events and states to include maximal events and states in and of the universe as a whole?

As indicated already, it is not essential to my argument that we do so, but I would find it somewhat mysterious if my version of PSR could not plausibly be enlarged to apply also to the universe as a whole, given that it is nothing more than a maximal series of events, states, and processes. But wouldn't this just introduce salient points into the phenomena, thus affording the critic partial explanations of the maximal events? No, because if we bring maximal events and states within the ambit of PSR, we are including—again, this is how I am stipulating it to be—*all* potential salient points, and we are now asking of everything, *including these*, whether there is a partial explanation of any maximal *S*-type state given an infinite past. If we are interested in the height of an oak tree, the beginning of the growth of the acorn from which it arose is an obvious fixed point. If we are interested in a billiard ball collision, the point at which one of the balls was struck and began moving toward the other one is also a fixed point of clear salience for us. If our concern is the number of orbits made by the earth around the sun, then the beginning of the solar system is again a fixed point. But if we take a maximal *S*-type state or event to include *all* of this and *everything else*, what salient points are left over for selection? If we ask why particular state *S* obtains *now*, we have to appeal to *prior* maximal *S*-type states. We cannot simply appeal to some nonmaximal state *within* a prior maximal state as a partial explanation, since it will

only partially explain some later nonmaximal state within our particular state *S* right now. So we have to appeal to prior *maximal* states to explain later maximal states. But that is just more of the same: there is nothing salient about any of these prior maximal states that would give us a fixed point for a partial explanation, assuming an infinite past. What could it be?

That said, the critic might try to construct a partial explanation from a prior maximal state by conjoining all of the nonmaximal states within that maximal state, each of which partially, via salience, explains a later nonmaximal state within *S* right now, and all of which, in total, partially explains maximal state *S* right now. Perhaps. Quite a few assumptions would have to be made, such as that every single nonmaximal state within the prior maximal state is indeed a salient fixed point for partial explanation of a nonmaximal state within *S* right now. There is no *a priori* reason for thinking this must be the case. So I am suggesting that there is a plausible expansion of PSR to include maximal states of the universe, such that these too have no partial explanation if the universe is infinite in the past.

Is there a fallacy of composition lurking in this line of argument? Well, the fallacy of composition needs to be handled with care. A team of champions might not necessarily make a champion team, but a bundle of wooden blocks can only make a *wooden* heap. There is no valid, general argument schema of the form: "All the parts of *X* are *F*; therefore *X* is *F*." But there are plenty of valid subschemata, depending on the choices for *X* and *F*. I contend that when it comes to events and states within the universe and the maximal collection of events and states that constitute the maximal state *S* of the universe at some time or other, there is no relevant difference for our purposes. This is because the whole just *is* the parts taken together as far as what we are interested in is concerned—all the law-governed physical[30] processes. Why should taking them all together effect an immediate difference in their explicability?

9 A false dilemma?

Morriston goes on to present a false dilemma for the defender of the PSR objection. The only alternative, he claims, to a substantivalist view of time that will also provide an explanation to our question about *S* (or BC) is one that takes time to be a "mere metric" on events. In that case, "the proper answer to the question, 'Why does E_0 happen at T_0 rather than at T_{-1}?' will be nothing more exciting than, 'Because that's how we applied our chosen metric to the series of events.'"[31] His analogy is the measuring of cloth against a ruler: we can line up the cloth at any point of the ruler we like in order to measure it, and the answer to why we've lined it up at, say, the one-inch mark rather than the very edge of the ruler is simply that we've chosen to do it that way—"hardly a question that 'cries out' for a 'sufficient reason' type answer."[32]

It is wrong to present a mere convention or choice as the only alternative to substantivalism for his opponent. As I argued earlier, the PSR question arises independently of any further question about the metaphysics of time. We can agree

with Morriston that the time at which the backward count terminates, or *S* obtains, is not a matter of arbitrary choice of metric. A difference in finishing time is founded on a real distinction in the world. But that distinction does not depend on substantivalism versus relationalism. To see that this is so, consider that the PSR question can legitimately be raised on *either* position. One way to raise it on a substantivalist view[33] is the way Morriston does, only to dismiss the question by dismissing the view. But Morriston has given us no argument whatsoever as to why the question does *not* arise on a relationalist view. On the contrary, he sidesteps this crucial issue completely. And it is hard to see what he could have said in defense of his position either. For if relationalism is true, and the temporal metric is nothing independent of the relations between events, states, and so on within the universe, we can *still* ask the question about the *age* of the universe, of course. We certainly did not have to settle the issue of the correct metaphysics of time before scientists set about developing their empirically informed theory that the universe is about 13.7 billion years old. For all we know, relationalism *might* be true—and yet the question of the universe's age is meaningful and relatively tractable. Indeed for the relationalist, that the universe now has reached a state 13.7 billion years from its origin just *is* a fact about the relations between all of the events, states, processes, and so on, occurring *within* the universe. There is no further question about their location within an independent temporal metric. So the explanation of why the universe is, say, 13.7 billion years old rather than 10 billion years old appeals, for the relationalist, to the very facts that explain its actual age and thereby preclude it from being any other—the actual positions of the galaxies, their actual rate of expansion, the initial conditions, operative laws, and the like. Had the quantities been different in this way or that, a different age would have obtained. But then the explanation of why the universe is in state *S* now rather than, say, 10 billion years ago appeals to precisely the same facts as those that explain why the universe is 13.7 billion years old rather than 10 billion years old. Once we know all the relevant laws, conditions, events, states, processes, and so on, we know why it is that *S* is reached 13.7 billion years from the origin of the universe rather than 10 billion years.

It goes without saying that this is all highly schematic and beyond the ken of current and likely any future science—but there is nothing opaque about what the schema of a relevant explanation looks like. All the questions one can legitimately pose about the state of the universe at a time arise whether substantivalism or relationalism is true. The answers are wholly empirical, just as much as the answers to questions about the universe's age itself. Now whether the underlying metaphysic is substantivalist or relationalist is interesting and important in its own right. Moreover, if substantivalism were true, we should expect our explanation of *S* not to be *inconsistent* with postulating an independent time or space-time metric. If, for example, general relativity does require postulation of space-time as an independent substance, as some think,[34] no contradiction should be expected. The same applies to relationalism. But these further metaphysical questions do not bear on our original question about the BC or *S*—a question that "'cries out' for a 'sufficient reason' type answer" on either metaphysic.

10 Conclusion

Throughout the lengthy and seemingly never-ending debate over the KCA, there has not in my view been nearly enough discussion of the PSR problem for an infinite past. Or, to put it more tendentiously, critics of the *kalām* such as Morriston—who is one of its foremost opponents—have not come to grips with the serious, and I contend insurmountable, problem that the PSR poses for a past with no beginning. In particular, they are too ready to dismiss the problem by appeal to "brute facts" or the alleged impossibility of formulating a version of PSR that is both plausible in its own right and generates the explanatory worry I have addressed in this chapter.

My argument here has been that we only need a *minimal* version of PSR to generate the explanatory worry. We need ask for no more than a partial explanation of a nonmaximal and relatively quotidian contingent fact about a given state's obtaining at a certain time, or a given event's occurring at a certain time, and so on. Armed with a relatively weak version of PSR, we should be able to see that things that need explaining have no explanation if the past is infinite. That *may* include maximal states of the universe, as I have tentatively argued—but it need not for my overall critique to succeed.

Nothing in what I have argued is in any way meant to derogate from the profound mystery that envelops the infinite. So any sense of unswerving confidence unintentionally conveyed above about the way infinity must be understood should be tempered by humbler words. I quote from a work by the Jesuit philosopher Father John Rickaby.[35] Having discussed infinity at some length, he ends: "On the ground above marked out we find a battlefield large enough for the quarrels which probably philosophers will not settle till the end of time, after which something higher than philosophy will enlighten those who, during life, have been consistently something higher than philosophers. Meantime we wait in humble acknowledgement of our limitations."[36]

Notes

1 This was at the annual meeting of the Evangelical Philosophical Society in November 2001. I am grateful to Wes Morriston, William Lane Craig, and the audience at that session for their very helpful comments and suggestions.

2 W. Morriston (2003), "Must Metaphysical Time Have a Beginning?," *Faith and Philosophy* 20: 288–306.

3 D. S. Oderberg (2002), "Traversal of the Infinite, The 'Big Bang', and the Kalam Cosmological Argument," *Philosophia Christi* 4: 305–34; Oderberg (2001), "The Kalam Cosmological Argument Neither Bloodied nor Bowed: A Response to Graham Oppy," *Philosophia Christi* 3: 193–96.

4 For example, G. Oppy (2006), *Philosophical Perspectives on Infinity* (Cambridge: Cambridge University Press).

5 L. Wittgenstein (1975), *Philosophical Remarks* (Oxford: Blackwell): 166.

6 According to J. Bennett (1971), "The Age and Size of the World," *Synthese* 23: 127–46 at 135.
7 Bennett, "The Age and Size of the World," 135.
8 Ibid., 136.
9 W. L. Craig (1991), "The Existence of God and the Beginning of the Universe," *Truth: A Journal of Modern Thought* 3: 85–96; Craig (1992), "Philosophical and Scientific Pointers to Creation *ex nihilo*," in R. D. Geivett and B. Sweetman (eds.), *Contemporary Perspectives on Religious Epistemology* (Oxford: Oxford University Press): 185–200, at 189–90; W. L. Craig and J. D Sinclair (2009), "The *Kalam* Cosmological Argument," in W. L. Craig and J. P. Moreland (eds.), *The Blackwell Companion to Natural Theology* (Oxford: Wiley-Blackwell): 101–201, at 121–22.
10 Craig, "The Existence of God and the Beginning of the Universe," 190.
11 F. Dretske (1965), "Counting to Infinity," *Analysis* 25, Supp. 3: 99–101, at 100.
12 R. Sorabji (1983), *Time, Creation and the Continuum* (London: Duckworth): 220, n.29.
13 Craig and Sinclair, "The *Kalam* Cosmological Argument," 121–22.
14 Oppy, *Philosophical Perspectives on Infinity*, ch.9
15 Ibid., 278–80.
16 Ibid., 278.
17 Pruss (2006), *The Principle of Sufficient Reason: A Reassessment* (Cambridge: Cambridge University Press).
18 I assume, as seems to be the case, that the average temperature of the universe is continually cooling over time, so that even a few days before now the average temperature was warmer by some miniscule amount to some large number of decimal places.
19 Morriston, "Must Metaphysical Time Have a Beginning?," 292.
20 Ibid., 293.
21 Ibid., 294.
22 Supplemented with facts about irreducibly probabilistic events, perhaps, as well as facts about the behavior of free agents.
23 Ibid., 293.
24 Ibid., 293.
25 Pruss, *The Principle of Sufficient Reason* ch.3.
26 Morriston, "Must Metaphysical Time Have a Beginning?," 293.
27 Once again confining ourselves, for simplicity, to the realm of the purely material.
28 Among others that could be given, depending on precisely what information the questioner is looking for.
29 Give or take a few years and leaving aside partial years!
30 In the broad sense.
31 Morriston, "Must Metaphysical Time Have a Beginning?," 294.
32 Ibid., 294.
33 There may be other ways of putting the question on a substantivalist view, but I am assuming Morriston's interpretation for the sake of argument.
34 For example Carl Hoefer, who is highly sympathetic to Einstein's version of space-time substantivalism: Hoefer (1996), "The Metaphysics of Space-Time Substantivalism," *The Journal of Philosophy* 93: 5–27.
35 J. Rickaby (1898), *General Metaphysics* (London: Longmans, Greens, & Co.): 220.
36 I am grateful to Graham Draper for comments on a draft of this chapter.

7

Craig and the *Kalām* Arguments

Graham Oppy

There has been extensive discussion of *kalām* cosmological arguments in recent times.[1] Revival of interest in these arguments is primarily due to the publication of Craig (1979a). In the following discussion, I shall focus primarily on the arguments in Craig (1979a); however, I shall supplement this discussion by reference to later publications wherever this seems to me to be appropriate. While Craig has changed his mind about some of the details and emphases in his views, there is a considerable similarity between the doctrines that have been endorsed in his various publications.

Craig (1979a) claims that the following syllogism is a sound and persuasive proof of the existence of an orthodoxly conceived monotheistic god:

1. Everything that begins to exist has a cause of its existence.
2. The universe began to exist.
3. (Therefore) The universe has a cause of its existence.

In support of the second premise, Craig offers four supporting arguments, two *a priori* and two *a posteriori.* These four supporting arguments are as follows:

1.1. An actual infinite cannot exist.
1.2. An infinite temporal regress of events is an actual infinite.
1.3. (Therefore) An infinite temporal regress of events cannot exist.

2.1. The temporal series of events is a collection formed by successive addition.
2.2. A collection formed by successive addition cannot be an actual infinite.
2.3. (Therefore) The temporal series of events cannot be an actual infinite.

3.1. Scientific observation strongly confirms standard Big Bang cosmology.
3.2. According to standard Big Bang cosmology, the visible universe arose from an initial singularity less than twenty billion years ago.
3.3. (Therefore) The universe began to exist.

4.1. The visible universe is in a state that is far from thermodynamic equilibrium.
4.2. If there were an infinite temporal regress of events, then the visible universe would not be in a state that is far from thermodynamic equilibrium.
4.3. (Therefore) The universe began to exist.

In support of the first premise, Craig offers two supporting arguments, though he also insists that it is not really in need of support: 'it is so intuitively obvious . . . that probably no one in his right mind *really* believes it to be false' (141).

5.1. There is overwhelming empirical support – "the strongest support that experience affords" – for the claim that everything that begins to exist has a cause of its existence.
5.2. (Therefore) Everything that begins to exist has a cause of its existence.

6.1. There can be no objects of knowledge unless there are *a priori* categorial structures of thought.
6.2. There are objects of knowledge.
6.3. If there are *a priori* categorial structures of thought, then it is knowable *a priori* that everything that begins to exist has a cause of its existence.
6.4. (Therefore) Everything that begins to exist has a cause of its existence. I shall begin by discussing the supporting arguments, before turning to a discussion of the standing of the syllogism that Craig identifies with "the *kalām* cosmological argument".

SUB-ARGUMENT 1. Craig offers an extended defense of the first philosophical sub-argument, including extensive defenses for each of the two premises of this sub-argument. We shall begin by examining the reasons that Craig offers for accepting each of the premises of this sub-argument.

In defense of the claim that "an actual infinite cannot exist", Craig offers several different kinds of considerations.

First, Craig argues against Platonism in the philosophy of pure mathematics, that is, against the view that mathematical entities exist. In particular, he argues against the view that Platonism affords a tenable interpretation of Cantor's transfinite numbers. The core of his argument is the claim that 'naïve Cantorian set theory gives rise . . . to irresolvable antinomies' (89), and the allegedly consequential claim that the only tenable responses to this situation are retreat to intuitionism and retreat to a kind of deductivist formalism ("axiomatization").

I think that this argument is very weak. There is good evidence that Cantor did not embrace the *logical* conception of sets that was espoused by Frege and Russell, and that does lead into the labyrinth of paradox; rather, Cantor espoused a *combinatorial* conception of sets that is more or less enshrined in the axioms of ZFC.[2] Moreover, quite apart from the views held by Cantor himself, it is clear that one can – and that many mathematicians do – embrace a Platonist interpretation of the theory of transfinite numbers that is embedded in ZFC. It is a serious mistake to suppose – as Craig does – that Platonists must be wedded to problematic principles of comprehension: there is no reason why Platonists cannot be combinatorialists. Furthermore, there are good reasons not to accept retreat to deductivist formalism: if the line that Craig takes here is seriously pursued, then it surely leads to the claim that classical mathematics should be rejected, and that either some kind of intuitionistic mathematics, or else some kind of finite mathematics, should be accepted in its stead. While this position can be

defended, the costs should be noted: on this view, we are committed to the claim that we can form no coherent understanding of the actual infinite. Consequently, when we come to consider an orthodoxly conceived monotheistic god and its attributes, we cannot then say either that an orthodoxly conceived monotheistic god is, or that an orthodoxly conceived monotheistic god's attributes are, actually infinite.

Second, Craig claims that even a 'basic exposition of the Cantorian system itself ought to make it intuitively obvious that it is impossible for an actual infinite to exist in reality' (72). In his view, the "purely conceptual nature" of the Cantorian system is made clear by the nature of transfinite arithmetic (75f.), and, in particular, by the fact that there is no definition of subtraction and division for transfinite cardinals (81). Moreover, this same conclusion is supported by such observations as that there are just as many points in a line as there are in a cube and that there are the same number of points in any lines, and by the "staggering" observation that ε_0 is less than (the limit ordinal that is identified with) $\aleph_1$.

Once again, I think that this argument is very weak. As consideration of Conway's **No** makes clear, there is no reason why one shouldn't have subtraction and division of transfinite ordinals and transfinite cardinals, if this is what one's heart is set upon. Of course, the rules for all of the arithmetic operations look different from the rules that apply in familiar finite arithmetic: but, as Conway emphasises, all of the arithmetic operations are defined only once – for all of the Conway numbers – and a little familiarity quickly breeds the view that these operations are natural. Moreover, it is quite unclear why one should suppose that the allegedly counter-intuitive behaviour of the transfinite ordinals and cardinals somehow casts doubt on the idea that the very smallest transfinite cardinals do find application to "the real world", unless one somehow supposes that classical mathematics should be rejected *in toto* and replaced with an acceptable intuitionistic or finite mathematics. If the Cantorian theory of the transfinite numbers is intelligible, then we can suppose that some parts of it find application "in the real world", while nonetheless granting that most of it does not. We can suppose that there are $\aleph_0$ objects, or c spacetime points, without going on to suppose that we can find "real world" applications for much larger Cantorian cardinals.

Third, Craig claims that the kinds of puzzle cases that are discussed in Oppy (2006) show that 'various absurdities would result if an actual infinite were to be instantiated in the real world' (82). As I note in that other work, there are good reasons for claiming that the puzzles to which Craig adverts – primarily Craig's Library and Hilbert's Hotel – actually show no such thing. Apart from the errors that Craig makes in his assessment of the puzzle cases that he discusses, the key point to note is that these puzzle cases simply have no bearing on, for example, the question of whether the world is spatially infinite, or the question of whether the world has an infinite past. At most, it seems that one might suppose that these puzzles show that there cannot be certain kinds of actual infinities; but one could hardly suppose that these puzzles show that there cannot be actual infinities of any kind.

In sum: the defense that Craig offers of the claim that there cannot be an actual infinite is very weak. We should agree that, if one is prepared to reject classical mathematics – and to embrace an intuitionistic or finite alternative – then one will be in a position to

deny that there can be actual infinities. However, we have not yet been given any good reason to think that those who accept classical mathematics cannot go on to suppose that there *could be* actual infinities. Moreover, if we do suppose that we have good reason for supposing that there cannot be an actual infinite, then we shall be committed to the claim that there is no sense in which an orthodoxly conceived monotheistic god could be actually infinite; if there is an orthodoxly conceived monotheistic god, then that orthodoxly conceived monotheistic god can know only finitely many things, can perform only finitely many actions, and so forth. And, of course, this worry persists even if we consider ways in which one might argue for the weaker claim that there is no actual infinite; while this weaker claim might be used to support the claim that the past is finite, it also has the consequence that an orthodoxly conceived monotheistic god is actually finite (though perhaps potentially infinite) in every respect.

In defense of the claim that an infinite temporal regress is an actual infinite, Craig begins with the observation that the claim seems 'obvious enough . . . if there has been a sequence composed of an infinite number of events stretching back into the past, then the set of all events would be an actually infinite set' (95). This seems right: an infinite number of events stretching back into the past would form an actually infinite set, as would an infinite number of events stretching into the future. However, Craig claims that an infinite number of events stretching into the future is not an actual infinity, but is rather a merely potential infinity. Consequently, he takes himself to have some work to do to establish that an infinite number of events stretching back into the past is not merely a potential infinity.

First, Craig argues that the past is real in a way that the future is not, because past events have existed: 'they have taken place in the real world, while future events have not since they have not occurred' (96f.). However, it seems to me that, if we are taking tense seriously – that is, if we are rejecting the four-dimensionalist view that is strongly supported by the general theory of relativity – then there is something odd about the way that Craig draws his past/future asymmetry. On the one hand, the past does not exist: while it was the case, it is no longer. On the other hand, the future does not exist: while it will be the case, it is not yet. If there are reasons of the kind that Craig is here countenancing for supposing that the past cannot be infinite, then surely those reasons will carry over to support the contention that the future cannot be infinite. Craig doesn't think that the past is real in the way that the present is: he doesn't suppose that it is possible for there to be travel into the past. Equally, he should be prepared to allow that the future is real in a way in which the past is not: the future is still to come in the real world, while the past is not, since it has already occurred. At the very least, there is plenty of room here for those who are unsympathetic towards actual infinities to conclude that the future must be finite (and then to worry about the consequences of this conclusion for claims about the extent of life after death).

Second, Craig claims that some of the puzzles that are discussed in Oppy (2006) – in particular, the Tristram Shandy puzzle – give us additional reason to suppose that the past series of events cannot be infinite. However, despite Craig's claim that 'the Tristram Shandy story. . .tells us that an actually infinite temporal regress is absurd', I think that the discussion in Oppy (2006) shows that that story establishes no such

conclusion. As we noted in that earlier discussion, one might think that there are principles of sufficient reason to which one can appeal in order to support the claim that the past series of events cannot be infinite. However, as I note in Oppy (2006), it is a delicate matter to discover a principle of sufficient reason that is both strong enough to yield the desired conclusion and yet not obviously in need of additional argumentative support. At the very least, it seems to me that we have not yet been given any reason at all to suppose that there are non-question-begging arguments in support of the claim that the past series of events cannot be infinite.

In sum: while I am happy to grant that an infinite temporal regress is an actual infinite, I do not think that Craig makes a good case for the claim that the future series of events can be infinite while the past series of events cannot be infinite. While one can insist that a word like "actual" or "real" marks a genuine metaphysical distinction between the past and the future – "the past is actual while the future is merely potential" – it seems to me that it is very hard to give non-question-begging content to this insistence. There are two perspectives – that of the presentist and that of the four-dimensionalist – from which there is no such distinction to be drawn. Since presentism and four-dimensionalism are both susceptible of serious philosophical support, this point alone should suffice to cast doubt on Craig's claim that his arguments 'will be sufficient to convince most people that the universe had a beginning' (99).

As Craig himself notes, there is a gap between the conclusion of the first sub-argument and the second premise of the main argument: perhaps one might think that, while the series of events in the universe is finite in the past, the universe itself is infinite in the past: 'the temporal series of events was preceded by an eternal, quiescent universe, absolutely still' (99). Against this suggestion, Craig offers two arguments, one *a priori* and one *a posteriori*. I do not propose to discuss these arguments here. Whether or not they are cogent, it seems to me to be plausible to suppose that, if the series of events in the universe is finite in the past, then so too is the universe itself. Since the first premise of the first sub-argument is so controversial – and since the considerations that Craig advances on behalf of that premise are so weak – we may perhaps be excused from considering the remainder of the argument in any depth.

SUB-ARGUMENT 2. As Craig observes, in effect, the second sub-argument comes into play only if the first sub-argument fails. If there cannot be an actual infinite, then, *a fortiori,* the temporal series of events cannot be an actual infinite. Consequently, we set aside any reasons that we might have for supposing that there cannot be an actual infinite when we turn to argue for the premises in this argument. If we tacitly appeal to the claim that there cannot be an actual infinite in order to support the premises in the second sub-argument, then we defeat the purpose of propounding this sub-argument.

On behalf of the first premise of this sub-argument – that is, the claim that the temporal series of events is a collection formed by successive addition – Craig observes that it seems "obvious enough". However, as I note in Oppy (2006), if one supposes that time has the structure of the real numbers and if one also supposes that there are continuous processes in time, then one will deny that past events form a *series,* and one will also deny that the collection of past events fall under a relation of *successive addition.* Since we are here not assuming that there cannot be an actual infinite, and

since time is modelled by the real numbers in so many of our most successful scientific theories, it is hard to see what grounds one could have for supposing that it is simply "obvious" that past events constitute a series formed by successive addition. At the very least, it seems to me that we need some very substantial independent argument before we are persuaded to accept this premise.

On behalf of the second premise of this sub-argument – that is, the claim that a collection formed by successive addition cannot be an actual infinite – Craig notes that it is tantamount to the claim that it is impossible to count to infinity. He offers the following illustration of what he takes to be the central difficulty: 'Suppose we imagine a man running through empty space on a path of stone slabs, a path constructed such that when the man's foot strikes the last slab, another appears immediately in front of him. It is clear that, even if the man runs for eternity, he will never run across all of the slabs. For every time his foot strikes the last slab, a new one appears in front of him, *ad infinitum*. The traditional cognomen for this is the impossibility of traversing the infinite.' (104)

In Craig's example, the question is not whether the man can run across all of the slabs, but rather whether he can run across infinitely many slabs. For, if he achieves the latter task and yet not the former, he will still have completed an actual infinite by successive addition. If we suppose that the rate at which the slabs appear is constant, then, in any finite amount of time, only finitely many slabs appear: there is no time at which infinitely many slabs have been crossed. However, if the man runs for an infinite amount of time – that is, if, for each n, there is an nth slab that the man crosses – it is nonetheless true that infinitely many slabs are crossed: there is an actually infinite collection that is formed by successive addition. (Of course, Craig will resist this way of characterizing matters: given his view that the future is not real, he will insist that it is at best true that infinitely many slabs will be crossed: the collection that is formed here by successive addition is at best "potentially infinite".)

But what if we suppose that the time lapse between slabs decreases according to a geometric ratio, and that the man is replaced by a bouncing ball whose height of bounce decreases according to the same geometric ratio? If the ball hits the first slab at one minute to twelve, the second slab at ½ minute to twelve, the third slab at ¼ minute to twelve, and so on, then the ball can come to rest on a slab at twelve, having made infinitely many bounces on different slabs in the interval between one minute to twelve and twelve. In this example, we have a process – the bouncing of the ball – that plainly does form an actual infinite by successive addition. Consequently, we don't need to challenge Craig's view about the reality of the future in order to reject the second premise of the argument under discussion: there are perfectly ordinary processes that involve formation of an actual infinite by successive addition in not obviously impossible worlds (in which space and time are composed of points, and there are no quantum or thermodynamical effects to rule out the precise application of classical kinematics to the motion of a bouncing ball). Since Craig has – for the purposes of this argument – renounced the claim that there cannot be actual infinities, it is quite unclear what reason we are supposed to have for rejecting this counter-example to the alleged impossibility of forming actual infinities by successive addition.[3]

To strengthen the case for the second premise in this sub-argument, Craig adverts to his discussions of Zeno's paradoxes and the first Kantian antinomy. But, as the discussion in Oppy (2006) makes clear, there is nothing in either Zeno's paradoxes or the first Kantian antinomy to support the claim that a collection formed by successive addition cannot be actually infinite. In his discussion of Zeno's paradoxes, Craig claims that all supertasks are impossible because the completion of a supertask requires the performance of an 'infinitieth' task, that is, a last task immediately before the end state is achieved. Thus, for example, in his examination of Thomson's lamp, Craig writes that: 'in the real world, the state of the lamp [at the end of the manipulations of the switch] . . . is determined by the state of the lamp at the prior instant, which would be the "infinitieth" moment in the series' (180). But, of course, the assumption that there must be an *immediately* prior instant is precisely what proponents of the possibility of this kind of supertask deny: if time is a continuum, then there is no instant that is immediately prior to a given instant.

If anything, the second of Craig's philosophical sub-arguments fares even worse than the first: there is no clear and uncontroversial support to be given to either of the two premises in this argument. While there are views that entail that a temporal series of events cannot be infinite – for example, the view that, as a matter of necessity, there are only finitely many temporal atoms – one requires some quite heavy duty metaphysical assumptions in order to adequately support the conclusion of the second philosophical sub-argument. If we suppose, as Craig suggests, that he is looking for arguments that ought to persuade more or less any reasonable person, then it is surely clear that neither of Craig's philosophical sub-arguments comes anywhere near to meeting this standard.

SUB-ARGUMENT 3. Study of the large-scale history and structure of the universe is one of the more speculative branches of physical science. Following Kragh (1996: 6f.), we may suppose that modern scientific cosmology-dates from work done in 1917 on global solutions to the field equations of general relativity. From Einstein's initial work until the mid-1960s, there was a substantial division of opinion amongst cosmologists, with many leading figures inclining towards steady-state theories. However, a variety of considerations – including the discovery of the cosmic background radiation by Penzias and Wilson in 1965 – motivated subsequent widespread acceptance of the idea that the visible universe is the result of expansion from an earlier state of much greater density and temperature. Subsequent developments – including the analysis of the COBE data – show that there is a very good fit between standard Big Bang models of the universe and empirical data back to quite early stages in the history of the visible universe. Even allowing for the speculative and volatile nature of scientific cosmology, it seems to me to be plausible to allow that there are non-initial segments of standard Big Bang models that are well confirmed by the empirical data.

Despite the good fit between non-initial segments of standard Big Bang models and empirical data, there are very few cosmologists who suppose that standard Big Bang models are well confirmed over the entire history of the universe. The sticking point, of course, is the account of the very earliest history of the universe. In standard Big Bang models, there is an initial blow-up scalar polynomial singularity, that is, a point at which physical components of the curvature tensor diverge. There are very few theorists who are prepared to allow that this is a true representation of the earliest

history of the universe. On a straight interpretation of the FRW models, there is no first moment at which the universe exists, but physical components of the curvature tensor diverge as $t \rightarrow 0$. Since Craig is a vociferous opponent of the actual infinite, he cannot possibly suppose that either of these features of the FRW models corresponds to anything in reality. But then, before we can draw any conclusions about the nature of the very earliest universe, we need to be presented with suitably modified FRW models in which these problematic features have been removed.

The construction of models that give an accurate representation of the very earliest universe is a matter of considerable current research activity. Since it seems plausible to suppose that the very earliest universe is a domain in which quantum mechanical considerations will be important, there is a widely held view that we shall not have our suitably modified FRW models until we understand how to unify quantum mechanics and general relativity in a quantum gravitational theory. But, at the time of writing, there is no reason to suppose that we are at all close to the construction of a satisfying theory of this kind. Consequently, we are in no position to draw any conclusions about the very earliest parts of the universe from the current state of cosmological theorizing.

If we are prepared to leave the domain of properly scientific theorizing, then we might suppose that – despite the lack of any decent scientific model of the earliest parts of the universe – we can nonetheless conclude from the available scientific data – and, in particular, from the goodness of fit between non-initial segments of standard Big Bang models and that data – that the universe "began to exist". After all, one might suppose, the very use of the terminology "the earliest parts of the universe" is surely an acknowledgment that there was "an absolute beginning of the universe about fifteen billion years ago" (130).

There are at least four reasons to be cautious here.

First, as noted by Earman (1995: 205f.), models of the Big Bang – such as the standard FRW models – are, in themselves, entirely neutral on the question of whether they model "an absolute beginning" of the physical universe. Whether the metric in an FRW model can be extended through the initial singularity depends upon the continuity/differentiability conditions that are placed on that metric. We might follow Geroch and Traschen in demanding that any physically meaningful extension of the metric should be *regular,* in that case, we shall conclude that there is no physically meaningful extension of the metric in a standard FRW model. However, at the very least, it is clear that we need some further justification for the claim that standard Big Bang models do in fact model "an absolute beginning" of the physical universe. Consequently, we are far from having good reason to suppose that not yet developed quantum-gravitational replacements for these standard Big Bang models will model "an absolute beginning" of the *physical* universe.

Second, as also noted by Earman (1995: 207), even if we suppose that there can be no physically meaningful extension of the metric through the initial singularity in standard FRW models, it does not follow that there can be no mathematically meaningful extension of the metric through that singularity. While it might be thought that this point supports the hypothesis that there might be a temporal domain in which God can perform the activities that result in the creation of the universe, it should be

noted that this hypothesis also leaves room for the suggestion that there is some other cause for the creation of the universe that is part of an infinite regress of contingent causes. If we suppose that there can be a mathematically meaningful extension of the metric through the initial singularity in an FRW model, and if we suppose that there can be causation in the domain of that extension, then there is nothing in the empirical data that allegedly supports the claim that there is such a singularity to rule out the claim that there is an infinite regress of contingent causes. At the very least, we should be very cautious in our treatment of the claim that we have good reason to suppose that not yet developed quantum-gravitational replacements for standard Big Bang models will model "an absolute beginning" of the *contingent* universe.

Third, as argued by Grünbaum (1991), even if we suppose that there is no meaningful extension of the metric through the initial singularity in standard FRW models, it is a mistake to suppose that there is "an absolute beginning" in these models. If there are no meaningful extensions of the metric through the initial singularity in standard FRW models, then, equally, there are no meaningful extensions of the metric to t=0 in these models. As Earman (1995: 208f.) notes, in the standard Big Bang models, for every time t there is an earlier time t, and the state of the universe at t is a causal determinant of the state of the universe at t. Thus, it turns out that, even in the standard Big Bang models, there is no "absolute beginning" of the physical universe. Once again, the properties of standard Big Bang models give us no reason at all to suppose that not yet developed quantum-gravitational replacements for these standard Big Bang models will model "an absolute beginning" of the *physical* universe.

Fourth, despite the difficulties that we have noted thus far, one might suppose that there is surely good reason to claim that modern scientific cosmology makes it plausible to claim that the universe is finite in the past: there have been no more than twenty billion years during which the physical universe has existed. Since this seems right, one might then go on to suggest that there is, after all, a perfectly good sense in which modern scientific cosmology supports the claim that the universe began to exist: something begins to exist iff it is finite in the past, whence, since the universe is finite in the past, it follows that the universe began to exist. However, the important point to keep in mind now is whether the first premise of the *kalām* argument is true under this interpretation of "begins to exist": is it true that anything that begins to exist has a cause of its beginning to exist under this interpretation of "begins to exist"? We shall return to this point later.

In view of the considerations that have been adduced here, it seems to me that we should conclude that there is no good reason to suppose that current scientific cosmology supports the contention that there was an "absolute beginning" of the universe about fifteen billion years ago. Given the current state of scientific cosmology, it does seem highly plausible to suppose that the visible universe is no more than twenty billion years old; but there are various reasons why support for this contention does not readily translate into support for the contention that the universe had an "absolute beginning" no more than twenty billion years ago. Unless we accept the claim that something begins to exist iff it is finite in the past, we have no reason to find any merit in the third of Craig's sub-arguments.

SUB-ARGUMENT 4. It would take us very far afield to try to give a proper discussion of the second of Craig's empirical arguments. For the purposes of the current work, it suffices to note that there is no stronger argument for an "absolute beginning" in the thermodynamical considerations to which Craig appeals than there is in contemporary scientific cosmology. At best, the thermodynamical considerations can establish only that the *physical* universe is finite in the past: they cannot establish that there is no infinite regress in the *contingent* universe; and neither can they establish that there was an initial state of the universe at t=0. Unless we accept the claim that something begins to exist iff it is finite in the past, we have no reason to find any merit in the fourth of Craig's sub-arguments.

Before we turn to an examination of the sub-arguments that Craig (1979a) offers in support of the first premise in his *kalām* cosmological argument, it is worth pausing to assess the overall contribution that the first four sub-arguments make in supporting the second premise in the *kalām* cosmological argument. I claim that the two *a priori* arguments are very weak indeed: they give no serious support to the claim that the physical universe began to exist. Moreover, I claim that the two *a posteriori* arguments at best support the claim that the physical universe is finite in the past. If we do not accept the claim that something begins to exist iff it is finite in the past, then we shall conclude that the two *a posteriori* arguments also fail to give substantial support to the claim that the physical universe began to exist.

SUB-ARGUMENT 5. As we have already noted, Craig claims that there is no real need to offer support for the claim that everything that begins to exist has a cause of its existence: the truth of this claim is allegedly so immediately apparent that no sane person could fail to recognize it. Nonetheless, he does go on to say that the claim has overwhelming empirical support: "it is repeatedly confirmed in our experience. Constantly verified and never falsified, the causal proposition can be taken as an empirical generalization enjoying the strongest support experience affords" (145).

Whether or not we suppose that we are dealing here with an empirical generalization, we are entitled to ask for clarification of the meaning of the claim whose truth is allegedly so evident that no sane person can reject it. On the one hand, we need to know more about what it takes for something to count as "beginning to exist"; on the other hand, we need to know more about what it takes for something to count as "a cause [of the existence of some thing]".

One might suppose – roughly following Grünbaum (1990) – that an object x begins to exist at a time t just in case: (1) x exists at t; (2) there are times prior to t; and (3) there is no time prior to t at which x exists.[4] Moreover, one might suppose that an object x begins to exist just in case there is some time t at which x begins to exist. On these assumptions, it does not seem immediately objectionable to claim that anything that begins to exist has a cause of its beginning to exist; and neither does it seem immediately objectionable to suggest that this claim finds strong empirical support. However, of course, it should also be noted that – whether or not we accord any reality to the time t=0 in standard Big Bang models of the universe – it is not true on the current assumptions that the universe – as modelled in standard Big Bang cosmology – began to exist. If we accept this account of what it is for something to begin to exist, then Craig's *kalām* argument is in ruins.

One might suppose – roughly following Craig (1992a) – that an object x begins to exist at a time t just in case: (1) x exists at t; and (2) there is no time prior to t at which x exists. Moreover, again, one might suppose that an object x begins to exist just in case there is some time t at which x begins to exist. On these assumptions, provided that we accord reality to the time t=0 in standard Big Bang models of the universe, it does turn out to be true that the universe – as modelled in standard Big Bang cosmology – begins to exist. However, if we do not accord any reality to the time t=0 in standard Big Bang models of the universe, then, on these assumptions, it is not true that the universe – as modelled in standard Big Bang cosmology – begins to exist. Since – as we have already seen – there is good reason to deny that the time t=0 is accorded any reality in standard Big Bang cosmology, we again have reason to hold that, on this account of what it is for something to begin to exist, Craig's *kalām* argument is in ruins. Moreover, even if we do suppose that we can accord reality to the time t=0 in standard Big Bang models of the universe, we now have to confront the question of whether it is plausible to claim that there is strong empirical support for the universal generalization that *everything* that begins to exist has a cause for its beginning to exist, on the current construal of "begins to exist". The answer to this question seems plainly to be negative. In experience, we only ever meet with objects whose coming into existence is preceded by times at which those objects do not exist. Nothing in experience bears on the question of the causal antecedents of objects that begin to exist at t=0. So, on the current account of what it is for something to begin to exist, the key premise in Craig's fifth sub-argument should be rejected: it is not true, on this account of what it is for something to begin to exist, that there is "the strongest support that experience affords" for the claim that everything that begins to exist has a cause of its beginning to exist.

One might suppose that an object x begins to exist at a time t just in case: (1) x exists at all times in some open or closed interval (t, t); and (2) x exists at no times in any open interval (t , t). Moreover, again, one might suppose that an object x begins to exist just in case there is some time t at which x begins to exist. On these assumptions, even if we accord no reality to the time t=0 in standard Big Bang models of the universe, it turns out that the universe – as modelled in standard Big Bang cosmology – begins to exist at t=0. However, as presaged by the discussion in the previous paragraph, we now have to face the question of whether it is plausible to claim that there is strong empirical support for the universal generalization that *everything* that begins to exist has a cause for its beginning to exist, on the current construal of "begins to exist". Once again, it seems to me that the answer to this question is negative. There is nothing in our experience that provides support for the universal generalization that, if an object x exists at all times in some open or closed interval (t, t), and at no times in any open interval (t , t), then there is a cause of the existence of that object in the open or closed intervals (t, t). In particular, nothing in experience bears on the question of the causal antecedents of objects that – in the sense now at issue – "begin to exist" at t=0. So, once again, on the current account of what it is for something to begin to exist, the key premise in Craig's fifth sub-argument should be rejected: it is not true, on this account of what it is for something to begin to exist, that there is "the strongest support that

experience affords" for the claim that everything that begins to exist has a cause of its beginning to exist.

Unless there is some other account of what it is for something to begin to exist that has been overlooked here, it seems to me that we are entitled to conclude – prior to any discussion of the use of the expression "a cause [of the existence of some thing]" – that the fifth of Craig's sub-arguments is extremely weak. While – for all that we have argued so far – there may be senses of "begins to exist" in which there is empirical support for the claim that it is true that everything that begins to exist has a cause of its beginning to exist, those are not senses in which there is any support for the claim that the universe began to exist.

SUB-ARGUMENT 6. Craig (1979a: 148) is ambivalent about the merit of the sixth sub-argument, and with good reason. Even if one accepts the highly controversial neo-Kantian assumption that there can be no objects of knowledge unless there are *a priori* categorial structures of thought, it is utterly unclear why one should suppose that, if there are *a priori* categorial structures of thought, then it is knowable *a priori* that *everything* that begins to exist has a cause of its beginning to exist. In particular, the claim – in itself highly controversial – that there can be rational thought only if there is a causal structure in the world that is reflected in the categorial structure of thought, supplies no evident support for the further claim that the categorial structure in question must accurately reflect the causal structure of the world at or very near to t=0. The reasons that we gave above for rejecting the fifth of Craig's sub-arguments carry over, more or less unchanged, as reasons for rejecting the sixth of his sub-arguments: there is nothing in *our* current experience, or in *our* ways of thinking about the current state of the world, that both provides substantive support for the claim that *everything* that begins to exist has a cause of its existence and yet does not undermine the claim that the universe began to exist.

Even if we are prepared to dismiss the sub-arguments that Craig offers in support of the first premise in his major syllogism, we must still confront his contention that the truth of this premise is so immediately apparent that no sane person could really fail to accept it. There are various comments that one might make about this apparently gratuitous slur on the many thoughtful atheists who have failed to accept that there is a sense of "begin to exist" in which it is true both that the universe began to exist and that everything that begins to exist has a cause of its existence.

First, if one is prepared to accept that conceivability is a good guide to possibility, then it is hard to see how one can deny that it is possible that there be physical universes that have no cause of their existence, since it seems plainly true that it is conceivable that there be physical universes that have no cause of their existence. Of course, as we noted in Oppy (2006), one can deny that conceivability is a good guide to possibility – but then one must be prepared to pay the costs of this denial. Moreover, if one accepts the claim that conceivability is a good guide to possibility, then, at the very least, one has some serious explaining to do if one wishes to maintain that physical universes that have no cause of their existence are merely "logical" – but not "real" – possibilities.[5]

Second, as we have already noted, there are hard questions to be asked about the meaning of the expression "a cause [of the existence of some thing]". Craig (1992a:

235) says clearly that he is here talking about *efficient* causes – and not about material causes, or formal causes, or final causes, or constitutive causes, or the like. Plausibly, then, the claim that we are investigating can be restated as the claim that any event of the coming into existence of a thing is an efficient effect of some other – distinct, independent – event or events.

This restatement still leaves open the question of what we should count as a 'thing'. If 'things' include states of affairs, then the claim is plausibly interpreted to be a kind of principle of sufficient reasons: every contingent state of affairs has an efficient cause, or the like. As I argue in Oppy (2006), there is good reason to reject any strong principle of this type; in particular, it is worth noting that no libertarian about freedom can suppose that every contingent state of affairs has an efficient cause. On the other hand, if 'things' are not meant to include states of affairs, but rather are to be limited to 'individual particulars', or the like, then it is worth asking why we should suppose that this more limited principle is worthy of belief when the more extensive principle plainly is not. I see no reason to accept that untutored intuition finds any more merit in the more limited principle than it finds in the more extensive principles; moreover, I see no evident reason why the kinds of arguments that Craig offered should not be taken to support the more extensive principles no less strongly than they support the more limited principle. If there can be contingent states of affairs that have no efficient cause of their coming to obtain, then why can't there be 'individual particulars' that have no efficient cause of their coming into existence?

Third, there are apparently possible cases that might be taken to controvert the claim that every 'individual particular' has an efficient cause of its coming into existence. Suppose, for example, that there is a kind of subatomic particle – an X-particle – that is unstable, and that can decay in one of two ways, but for which it is an objectively chancy matter which type of decay occurs when this kind of particle decays. On the one hand, an X-particle can decay into an α-particle and a γ-particle; on the other hand, an X-particle can decay into a β-particle and a δ-particle. Suppose, now, that a particular X-particle decays into an α-particle and a γ-particle. Is there an efficient cause of the coming into existence of the α-particle in this case? Plainly enough, there is a material cause: the existence of the X-particle is a material cause of the existence of the α-particle. But it might be said that the objectively chancy nature of the decay process yields the result that the existence of the X-particle is not an efficient cause of the existence of the α-particle; and it might be further suggested that there is no other plausible candidate efficient cause for the existence of the α-particle.

I don't say that it is obviously right to assert that, in the case described, there is no efficient cause for the existence of the α-particle. However, I do think that this case makes it clear that, before we can assent to the claim that there is an efficient cause for the coming into existence of any thing, we need to be told a lot more about the analysis of efficient causation. There are many different philosophical theories of efficient causation, and some of those theories allow that, in the case described, there is no efficient cause for the existence of the α-particle. Of course, those theories that allow that, in the case described, there is no efficient cause for the existence of

the α-particle may be mistaken; but we need to move beyond the level of appeal to untutored intuition in order to decide whether or not this is really so.

While there is clearly more to be said on this topic, I think that I have already said enough to justify the contention that it is not in the least bit obvious that everything that begins to exist has an efficient cause of its beginning to exist. For all that has been argued so far, it may be that it is nonetheless true that everything that begins to exist has an efficient cause of its beginning to exist – but, at the very least, those who suppose that it is true have much work to do to convince those who do not agree with them.[6]

Conclusion

. . . I have argued: (1) that the two premises in Craig's major *kalām* syllogism receive no adequate support from the sub-arguments that he advances on their behalf, and (2) that there is no good reason to accept Craig's contention that the first premise is so obvious as not to stand in need of any support. On the basis of this prior argumentation, I think that it is reasonable to conclude that Craig's case is unpersuasive: there is nothing in his major syllogism, nor in the supporting arguments that he advances on behalf of the premises in this major syllogism, that should persuade any reasonable person not already convinced of the truth of the conclusion of that syllogism to accept that the universe has a cause of its existence. Of course, this is not to say that there is good reason to reject the claim that the universe has a cause of its existence; and neither is it to say that there are no theists whose belief that the universe has a cause of its existence is reasonable. To argue for either of those contentions would be to engage in a project vastly different from the one that I have undertaken here: for all that I have tried to do is to show why one ought not to suppose that Craig's *arguments* are good.

Notes

1 See, e.g.: Marmura (1957), Hourani (1958), Fakhry (1959), Wolfson (1966, 1976), Goodman (1971), Craig (1979a, 1979b, 1985, 1988, 1991a, 1991b, 1991c, 1992a, 1992b, 1992c, 1993a, 1993b, 1994a, 1994b, 1997a, 1999, 2000, 2003a), Mackie (1982), Wainwright (1982), Sorabji (1983), Conway (1984), Smith (1985, 1987, 1988, 1991 1993a, 1994a, 1995b), Davidson (1987), Goetz (1989), Prevost (1990), Grünbaum (1990, 1991, 1994, 1996, 2000), Oppy (1991, 1995a, 1995b, 1995c, 1996d, 2001b, 2002a, 2002b, 2002c, 2003a), Morriston (1999, 2002a, 2002b), and Oderberg (2002a, 2002b).

2 Zermelo-Fraenkel Set Theory with the Axiom of Choice.

3 Craig (1979a: 186n12) does say that 'a real ball is never perfectly resilient and so never bounces an infinite number of times before coming to rest'. If this is the claim that, in the actual world, balls are not perfectly resilient, then it seems unexceptionable: there are good thermodynamical – and quantum mechanical – reasons for denying that balls are perfectly resilient. Consequently, there are also good reasons for denying that, in

worlds sufficiently like the actual world, balls are perfectly resilient if you hold fixed enough of the actual laws and the actual boundary conditions, then you will surely have a world in which balls are not perfectly resilient. But nothing that we have said so far rules out acceptance of the claim that there are possible worlds governed by physical laws that are not altogether unlike the laws that obtain in our world, and yet in which balls are perfectly resilient. Moreover, it is precisely a claim of this form that is accepted by defenders of the possibility of supertasks, such as Benacerraf (1962) and Earman and Norton (1996). Despite Craig's numerous assertions that his opponents confuse "real possibilities" with "merely mathematical possibilities", it seems to me that it is rather Craig's insistence on the simple – and under-explained – division between "real possibilities" and "merely mathematical possibilities" that causes him to misrepresent the views of those whom he attacks. Possible worlds governed by laws and boundary conditions that are similar in some – but not all – ways to the laws and boundary conditions that govern the actual world are "real" possible worlds: worlds in which there are concrete, physical objects, and not merely numbers, sets, and other mathematical "abstractions".

4 In place of (3), Grunbaum actually offers:

(3′) There is a temporal interval (t , t) immediately prior to t at which x does not exist.

Unlike the formulation in the main text, this formulation allows for the possibility of intermittent existents, i.e., objects that come into and go out of existence. It is not clear to me that one ought to allow that this is a possibility. In any case, the question of the possibility of intermittent objects is clearly tangential to the issues that are the primary focus of the present discussion. Those who are concerned about the failure of the subsequent discussion in the main text to address this alleged possibility are free to make the necessary – and straightforward – amendments.

5 It should be noted that the sense of possibility at issue here is plainly not that "narrow" logical possibility that is constituted by freedom from inconsistency in first-order logic. I take it that, however the notion of "conceivability" is spelt out, it is not conceivable that 2 + 1 = 7, or that some prime numbers weigh more than Jackie Gleason. Uncaused physical universes are conceivable in a way in which these "narrow" logical possibilities are not. (Cf. Craig (1993b: 2) for the accusation that I conflate "narrow" logical possibility with "broad" logical possibility, i.e., with the kind of possibility that he denies to uncaused physical universes.)

6 One possible response to this criticism – if it is deemed to be telling – would be to amend the first premise in the *kalām* syllogism to the claim that everything that begins to exist has either an efficient cause or a *material* cause of its beginning to exist. While there is no less support in experience, or in consideration of the Kantian categories, for the claim that everything that begins to exist has a material cause for its beginning to exist – and while there is equally no less support in untutored intuition for this claim – it is plain that one could not argue for the existence of an immaterial God on the basis of this premise. However, it is not clear that the move to the weaker, disjunctive claim improves matters much: for the *kalām* syllogism is not intended to issue in the conclusion that the universe has either an efficient cause or a material cause for its beginning to exist. At the very least, one needs further supporting argument in order to get from the weaker, disjunctive claim to the desired conclusion that the universe has an efficient cause for its

beginning to exist. (It is perhaps worth nothing that there are various places in which Craig has addressed the question of whether pair production in a quantum mechanical vacuum constitutes violation of the principle that everything that comes into existence has a cause of its coming into existence – see, e.g., Craig (1979: 165) and Craig (1997a: 241). While one can correctly insist that there is a *material* cause for the coming into existence of particles that are produced in this way, it is highly doubtful whether one is entitled to claim that there is an *efficient* cause for this coming into existence.)

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8

Graham Oppy on the *Kalām* Cosmological Argument

William Lane Craig

Introduction

In recent years the ancient *kalām* cosmological argument has enjoyed something of a renaissance.[1] The argument takes the form of a simple syllogism:

1. Everything that begins to exist has a cause.
2. The universe began to exist.
3. Therefore, the universe has a cause.

Conceptual analysis of the notion of a cause of the universe enables one to recover a number of striking properties of this cause and to assess its significance for theism.

Graham Oppy has emerged as one of the *kalām* cosmological argument's most formidable opponents.[2] Now if Oppy claimed no more with respect to the *kalām* cosmological argument than what he says of theistic arguments in general, namely, that none of them is, in a strong sense, rationally compelling,[3] then the contemporary *mutakallim* (or practitioner of *kalām*) might have little dispute with Oppy, choosing rather to challenge Oppy's lofty standard of what constitutes a "good" argument.[4] Fortunately for discussion's sake, Oppy's appraisal of the *kalām* cosmological argument is so abysmally low that that standard scarcely even comes into view in his discussion. In Oppy's judgement, the philosophical arguments on behalf of the *kalām* cosmological argument's key premise are "very weak," providing "no serious support" for the claim that the universe began to exist, while the scientific arguments in support of that claim are bereft of "any merit," supporting at most the finitude of the universe in the past. Similarly, the argument's first premise is "not in the least bit obvious," and the arguments offered on its behalf are "extremely weak." If Oppy's critique is correct, the *kalām* cosmological argument, even when assessed by standards more realistic and reasonable than Oppy's own, falls short of being a good argument. In this response, I hope to show that the argument is, in fact, considerably stronger than Oppy claims, surviving even his trenchant critique.

Arguments for the Second Premise

Let us turn first to an examination of the four supporting arguments I offer on behalf of premise (2). Although Oppy characterizes these as two *a priori* and two *a posteriori* arguments, this characterization is mistaken, since there is no suggestion that the premises of the two philosophical arguments can be known to be true independent of experience, indeed quite the contrary. We should remind ourselves that even metaphysically necessary truths may in some cases be knowable only *a posteriori*. A more accurate classification of these supporting arguments would differentiate metaphysical arguments from physical arguments for the beginning of the universe.

First Supporting Argument

The first supporting argument for the finitude of the past is as follows (using Oppy's numbering):

1.1 An actual infinite cannot exist.
1.2 An infinite temporal regress of events is an actual infinite.
1.3 Therefore, an infinite temporal regress of events cannot exist.

Oppy's Worry about (1.2)

Oppy agrees with (1.2): "I am happy to grant that an infinite temporal regress is an actual infinite."[5] Not content with that concession, however, Oppy raises the worry that the same arguments that show the past to be finite will require that the future be finite as well. This concern is curious, since it is irrelevant to the soundness of the argument before us. If the argument implies that the future as well as the past is finite, then (metric) time will someday come to an end (in a Big Crunch, perhaps?), just as it had a beginning. Oppy muses that we shall then have to "worry about the consequences of this conclusion for claims about the extent of life after death."[6] Such a worry is misplaced, however, for the *kalām* cosmological argument makes no claims about life after death, much less its temporal extension. It is hard not to see here a reference to claims of revealed religion which is out of place in this context.

But to consider the worry on its own merits: it is up to Oppy to show that the same arguments against the infinitude of the past imply that the future cannot go on forever. Oppy rightly discerns that on four-dimensionalism, according to which time is tenseless, the distinction between past and future is mind-dependent or perspectival, so that if an actually infinite number of events cannot exist, time must be finite in both the *earlier than* and *later than* directions.[7] But the *kalām* cosmological argument presupposes from start to finish a theory, not of tenseless time, but of tensed time, according to which temporal becoming is an objective feature of the world. On such a view the future in no sense exists but is pure potentiality. This view seems to allow room for a third option: that while the universe has only a finite past, it has a

potentially infinite future. With respect to the future infinity serves merely as an ideal limit which the series of successive events ceaselessly approaches but never achieves. By contrast a beginningless past cannot be merely potentially infinite, lest we commit ourselves to the incoherence of the temporal regress of events' being finite in the past but ceaselessly growing in the *earlier than* direction! This fundamental asymmetry of tensed time subverts assertions that arguments against the infinitude of the past entail that the future must be finite and so come to an end.

Ironically, then, when Oppy asserts, "If there are reasons . . . for supposing that the past cannot be infinite, then surely those reasons will carry over to support the contention that the future cannot be infinite,"[8] the *mutakallim* may greet Oppy's claim with insouciance, for he, in a sense, agrees with Oppy's contention that the future cannot be infinite, namely, if we take "infinite" univocally throughout to signify "actually infinite." What he disputes is Oppy's slide from the conclusion that the future is not actually infinite to the conclusion that the future is finite—an inference which holds only if one presupposes a theory of tenseless time. If we instead take "infinite" univocally to signify "potentially infinite," then it is not the case that the argument against the infinity of the past, namely, the impossibility of backward continuing, carries over to support the contention that the future cannot be infinite.

Oppy concludes that while one may insist that the past is actual and the future is potential, it is "very hard to give non-question-begging content to this insistence. There are two perspectives—that of the presentist and that of the four-dimensionalist—from which there is no such distinction to be drawn."[9] Conspicuously missing here is the so-called "growing block" view of the past defended by C. D. Broad and Michael Tooley, according to which temporal becoming is a mind-independent reality but according to which events, once having become, do not cease to be. Perhaps Oppy does not mention this option because he aims merely to show that there are serious philosophical views according to which there is no metaphysical distinction between past and future. Granted; but then the claim that the future is metaphysically distinct from the past is no part of the *kalām* cosmological argument. It was Oppy who raised the dialectically irrelevant objection that arguments for the finitude of the past also imply the finitude of the future. The *mutakallim* agrees that this is the case if time is tenseless but can challenge Oppy to show that that conclusion follows if time is tensed. It is now Oppy's responsibility to show that there are no philosophically tenable options according to which the future, unlike the past, is potentially infinite. Merely mentioning presentism and four-dimensionalism does not do the trick.

Moreover, it is far from clear that the presentist is unable to draw a meaningful distinction between the actuality of the past and the potentiality of the future. Future events have not as of yet been actualized, whereas past and present events have been actualized. Oppy rejoins that if we say something like this, then we "should be prepared to allow that the future is real in a way in which the past is not: the future is still to come in the real world, while the past is not, since it has already occurred."[10] This rejoinder is odd because Oppy's characterization captures nicely, in my mind, precisely the way in which the future is *un*real and merely potential.

In sum, Oppy agrees with (1.2); and his attempt to show that the argument for the finitude of the past also implies the finitude of the future is irrelevant and, given a theory of tensed time, in any case unsuccessful. Therefore, the key premise under dispute is (1.1).

Oppy's Objection to (1.1)

Before we look at Oppy's objection to (1.1), it is worth re-iterating that when it comes to the claim that an actual infinite cannot exist, I am not talking about what is often called "mathematical existence," which basically amounts to freedom from proven, strict logical inconsistency. Logical consistency in this sense is usually taken to legitimize a mathematical notion, so that the relevant entities are taken to "exist" in the sense that such a notion plays a legitimate role in mathematical theorizing. This point is important because Oppy tends to blur the distinction between mathematical existence and what we might call pleonastically "ontological existence." The latter is the subject of debate between Platonists and anti-Platonists with respect to mathematical and other abstract objects. This is a dispute of an ontological, rather than merely logical, nature. Hence, anti-Platonists, whose ontologies do not include mathematical objects, are typically quite content to accord mathematical legitimacy to, say, the set theoretical hierarchy, while Platonists, whose ontologies do include mathematical objects, include among their ranks Intuitionists who reject the legitimacy of higher mathematics.

Oppy classifies anyone who rejects the existence of an actual infinite as either a finitist or a potential infinitist.[11] He applies this taxonomy to both pure and applied mathematics with regard to proponents' views on experience, reasonable belief, and ontology respectively. The use of the term "ontology" in this connection is, however, misleading. Oppy is not, in fact, exploring the question of which, if any, numbers exist—otherwise, there is no room in his taxonomy for the anti-Platonist position that no numbers at all exist, however extensive the universe of mathematical discourse may be. Recognizing that Platonism is controversial, Oppy begs off a discussion of it; rather his concern is whether putative numbers are really numbers, that is, entities that *would* exist *if* all of classical mathematics were true and the quantifiers used in classical mathematics were ontologically committing.[12]

What Oppy means by "ontology," then, is really the question of the extent of legitimate mathematical discourse. The anti-Platonist need by no means be a finitist or potential infinitist in pure mathematics, since he denies either that the statements of classical mathematics are *literally* true or else that their truth commits one ontologically to the entities quantified over. When it comes to infinity in applied mathematics, Oppy's concern is with the question of contingently instantiated infinities.[13] Thus the question of the existence of an actual infinite in the realm of mathematical objects like numbers has been passed over—unless one holds with Hartry Field that mathematical objects, if they exist at all, do so contingently. Oppy provides a similar taxonomy of finitism, potential infinitism, and actual infinitism in applied mathematics.

Oppy's declining to deal with the debate over Platonism with respect to mathematical objects affects his final taxonomy of views of the infinite: he lists as the four contending views strict finitism, weak potential infinitism, strong potential infinitism, and

(strong) actual infinitism.[14] The problem is that these same categories were used to classify positions both with respect to the extent of legitimate mathematical discourse and with respect to the number of contingently existing objects in any domain. Oppy characterizes the strict finitist as having "no proper use of the concept of the infinite;" as rejecting classical mathematics; as allowing only finite domains and magnitudes and only finitely many possible worlds. This conflation of positions with respect to two quite distinct questions leaves no room for someone who is a finitist ontologically but an actual infinitist about mathematical discourse, which he regards as fictional or as not ontologically committing.

Similarly, when Oppy concludes, "If we suppose that we understand classical mathematics, then either we shall be strong potential infinitists or we shall be strong actual infinitists,"[15] he is conflating the debate over what constitutes legitimate mathematical discourse and the debate over ontology. Oppy must be supposing that Platonism is true and that therefore mathematical discourse is ontologically committing. Why else would he conclude, "To reject the suggestion that it is a contingent matter whether classical conceptions of infinity find application to the extra mathematical world, either we shall be intuitionists or constructivists—hence rejecting classical mathematics and, very likely, classical logic—or we shall be strict finitists"?[16]—in opposition to one who holds that it is metaphysically necessary that no actual infinite exist in the extra-mathematical world, just as it is metaphysically necessary that no mathematical objects at all exist, despite the quite legitimate use of the fictional or ontologically non-committing language of classical mathematics.

Now Oppy does not presume to deny the truth of (1.1), for he knows that finitism, whether mathematical or ontological, is a tenable position espoused by some of the most eminent philosophers and mathematicians. He seeks merely to undercut (1.1) by showing my defense of ontological finitism to be very weak. Unfortunately, his reconstruction of my defense misrepresents my case by treating sub-points as major points and then declaring them inadequate as probatory support of (1.1). In point of fact I present only one consideration in defense of (1.1), to wit, "that while the actual infinite may be a fruitful and consistent concept in the mathematical realm, it cannot be translated from the mathematical world into the real world, for this would involve counter-intuitive absurdities."[17] My exposition of Cantorian set theory is merely a *praeparatio* for the introduction of the puzzle cases elsewhere discussed by Oppy, and my animadversions on the ontological status of sets was a defensive move aimed at showing that ontological finitism does not imply mathematical finitism.

The key consideration, then, is the puzzle cases. Before we discuss some of these cases, however, we should do well to dismiss another theological intrusion into Oppy's critique: if (1.1) is true, he claims, then there is no sense in which God can be actually infinite. He "can know only finitely many things, can perform only finitely many actions, and so forth."[18] This theological consequence is irrelevant to the argument for (1.1) The *kalām* cosmological argument does not even aspire to prove that the personal Creator of the universe is omniscient or omnipotent. Moreover, we see again the slippage from denying that God is actually infinite in the quantitative sense at issue in (1.1) to the conclusion that God is finite in various respects. This does not follow

(nor does Oppy present any argument for the implication), since the quantitative sense of infinity may be simply inapplicable to God. Omniscience need not entail knowing an infinite number of, say, propositions, nor need we think of omnipotence as entailing the ability to do an infinite number of actions.[19] There is thus no reason to think that an orthodoxly conceived monotheistic God is susceptible to this sort of quantitative analysis.

Turn now to what Oppy calls the puzzle or problem cases. Because these involve, not strict logical inconsistencies, but, as I put it, "counter-intuitive absurdities," whether one finds them troubling enough to embrace (1.1) will be to a considerable degree subjective. I find them sufficiently troubling, and I hope my readers will, too; indeed, I think they should, although I do not aspire to prove this.[20] Benardete, who is especially creative and effective at concocting such thought experiments, puts it well: "Viewed *in abstracto*, there is no logical contradiction involved in any of these enormities; but we have only to confront them *in concreto* for their outrageous absurdity to strike us full in the face."[21]

The "key point" that Oppy wants to make with regard to such cases is that they show at most that certain kinds of actual infinities cannot exist, but that this conclusion cannot be generalized.[22] This riposte strikes me as appropriate with respect to certain puzzles involving actual infinites; for example, those imagining completion of a so-called super-task, the sequential execution of an actually infinite number of definite and discrete operations in a finite time. But when it comes to cases involving the simultaneous existence of an actually infinite number of familiar macroscopic objects, then this sort of response seems less plausible. The difficulty here is two-fold: (i) nothing in the various situations seems to be metaphysically impossible apart from the assumption of an actual infinite; and (ii) the absurdities are not tied to the particular kinds of objects involved. If a (denumerably) actually infinite number of things could exist, they could be numbered and manipulated just like the guests in Hilbert's Hotel or the books in an infinite library. In cases like these, any metaphysical absurdity is plausibly attributed to the existence of an actual infinite rather than to the particularities of the case. Thus, the problem cases of this sort do, it seems to me, call into question the possibility of the existence of an actually infinite number of things.

In any case, when we turn to Oppy's detailed discussion of Hilbert's Hotel,[23] he does not, in fact, adopt the above strategy for dealing with the puzzle. Instead, he proposes simply to "*outsmart*" those who present such problem cases, where "outsmart" is defined as follows: "*Outsmart,* v. To embrace the conclusion of one's opponent's *reductio ad absurdum* argument."[24] He says that the finitist faces a dilemma: if a detailed physical account cannot be given of a hotel that would permit the transposition of guests envisioned in the story, then the metaphysical impossibility of Hilbert's Hotel lies, not in its actual infinity, but in the envisioned maneuvering of guests. Although Oppy makes the point that the possibility of an infinite hotel with no vacancies does not commit one to the possibility of accommodating more guests by shifting guests about—maybe the hotel's construction hinders the guests' movements or the guests die off before their turn to move comes round—, nevertheless he remains fairly confident that the requisite account could be given. But if there is a way of giving such a detailed

account, he asserts, then it turns out that Hilbert's Hotel is possible after all. "There can, after all, be a hotel in which infinitely many new guests are accommodated, even though all the rooms are full, via the simple expedient of moving the guests in room *N* to room 2*N* (for all *N*)."[25]

But how does that follow? The ontological finitist does not think that the metaphysical impossibility of Hilbert's Hotel lodges in mere physical considerations of layout and construction but in the supposition that an actual infinite can exist. Giving a detailed account of the construction of Hilbert's Hotel on the assumption that an actually infinite number of things can exist provides no non-question-begging reason to think the whole scenario possible. Oppy justifies his recourse to the outsmarting strategy with the assertion, "these allegedly absurd situations are just what one ought to expect if there were . . . physical infinities."[26] This justification, however, falls short: for counterfactuals of the form "If a physical infinity of such-and-such a nature were to exist, then such-and-such a situation would obtain" are not in dispute. The problem cases would, after all, not be problematic if the alleged consequences would not ensue! Rather the question is whether these consequences really are absurd. The outsmarting strategy does nothing to alleviate one's doubts that a Hilbert's Hotel is absurd.

Moreover, what would Oppy say about scenarios involving inverse arithmetic operations regarding the guests in Hilbert's Hotel?[27] In transfinite arithmetic, inverse operations of subtraction and division with infinite quantities are prohibited because they lead to contradictions, but in reality one cannot stop people from checking out of a hotel if they so desire! In this case one does wind up with logically impossible situations, such as subtracting identical quantities from identical quantities and finding non-identical differences. We shall have occasion to discuss other problem cases below, but, in the meantime, I am far from satisfied with Oppy's attempt to take the sting out of a problem case like Hilbert's Hotel by simply "outsmarting" his opponent.

In sum, once the irrelevant theological considerations are set to the side, we find that Oppy actually agrees with the second premise of the first supporting argument for the finitude of the past and fails to establish what he says is the "key point" with respect to the first premise, preferring instead simply to "outsmart" his opponent, a strategy which falls short in showing why we ought not to be troubled by the apparent absurdity of the problem cases. Nor need we, *pace* Oppy, abridge classical mathematics in order to reject reasonably the metaphysical possibility of an actual infinite.

Second supporting argument

The second supporting argument for the beginning of the universe is as follows:

2.1 The temporal series of events is a collection formed by successive addition.
2.2 A collection formed by successive addition cannot be actually infinite.
2.3 Therefore, the temporal series of events cannot be actually infinite.

In Oppy's view, this argument "fares even worse than the first," for no clear and uncontroversial support can be given for either of its premises.[28] Although the demand for *uncontroversial* support is unrealistic, Oppy's claim that no clear support is forthcoming is important.

Oppy's Objection to (2.1)

Although in my original exposition of the *kalām* cosmological argument I took (2.1) to be "obvious enough," Oppy seeks to undercut (2.1) by demanding "some very substantial independent argument" before we are persuaded to accept it.[29] For, he points out, if time has the structure of the real numbers and if there are continuous processes taking place in time, then the collection of past events will not have been formed by *successive addition*.

It seems to me that this objection is based on multiple misunderstandings. In the first place, by "successive addition" I meant the accrual of one new element per (later) time through a process of temporal becoming. As we shall see, Oppy understands successive addition tenselessly or even timelessly. Second, I stipulate that all the events in the temporal series under consideration have equal, non-zero duration. Defining my terms, I wrote,

> By an 'event,' I mean any change occurring within the space-time universe. Since any change takes time, there are no instantaneous events. Neither could there be an infinitely slow event, since such an 'event' would in reality be a changeless state. Therefore, any event will have a finite, non-zero duration. In order that all the events comprising the temporal regress of past events be of equal duration, we arbitrarily stipulate some event as our standard, and, taking as our point of departure the present standard event, we consider any series of such standard events ordered according to the relation *earlier than*. The question is whether this series of events is comprised of an actually infinite number of events or not.[30]

Even if time itself has the structure of the real numbers and there are continuous physical processes, nevertheless the series of events, as defined, will be formed by successive addition. If we take, for example, the collection of past seconds in the history of the universe, such a collection has been formed by the successive addition of seconds, even if those seconds can themselves be divided into infinitely many sub-intervals.

While I still think that (2.1) is obvious enough, nonetheless I do recognize that it is susceptible to powerful putative defeaters which will require substantial independent argument for (2.1) in response. For (2.1) assumes a theory of tensed time and the reality of temporal becoming. When I wrote *The Kalām Cosmological Argument* I was vaguely aware of theories of tenseless time but did not really take them seriously. Since then I have come to appreciate that tenseless time theorists like Oppy himself need to be taken very seriously, indeed, and so I have devoted two volumes to a defense of a

theory of tensed time and of the objectivity of temporal becoming.[31] While I still think that temporal becoming is as obvious as can be, even more obvious than the existence of the external world given us by sense perception, so that someone encountering (2.1) in ignorance of theories of tenseless time is quite within his rights in accepting it without substantial independent argument, nonetheless I recognize that a considerable defense must be mounted against detensers and defenders of the mind-dependence of becoming in order to defeat their proffered defeaters.

Moreover, I have myself argued elsewhere that if temporal becoming is an objective feature of reality, then time cannot have the structure of the real numbers.[32] For temporal becoming would require the lapse of consecutive instants of time, which do not exist if time is continuous. Hence, if temporal becoming is real, as the *kalām* cosmological argument assumes, then Oppy's view of time as a composition of instants is false. Since Oppy raises no other objection to (2.1), I hope by my above-referenced work to have met his demand for very substantial independent argument on its behalf.

Objections to (2.2)

In support of (2.2) I have argued that just as it is impossible to count to infinity, so is it impossible to count down from infinity. I take it that given the reality of temporal becoming the impossibility of counting to infinity is patent, since one cannot convert a potentially infinite series into an actually infinite series by successive addition of finite quantities. For, given any finite number n, n+1 equals a finite number. Hence, $\aleph_0$ has no immediate predecessor; it is not the terminus of the natural number series but stands, as it were, outside it and is the number of all the members in the series. While we can imagine an actually infinite series of events mapped onto a tenselessly existing infinite series of temporal intervals, such that each consecutive event is correlated with a unique consecutive interval, the question remains whether such a sequence of intervals can be instantiated, not tenselessly, but one interval after another. As remarked, the very nature of the actual infinite precludes this.

It is therefore surprising to find Oppy challenging the claim that an actual infinite cannot be formed by beginning at a point and successively adding members to the collection. I cannot help but think that his habit of thinking in tenseless categories misleads him here. For example, when Oppy, imagining a man running through empty space on a path of stone slabs so constructed that when his foot strikes the last slab another appears in front of him, says, "if the man runs for an infinite amount of time—that is, if for each [natural number] n, there is an nth slab that the man crosses—it is nonetheless true that infinitely many slabs are crossed: there is an actually infinite collection that is formed by successive addition,"[33] one is struck by the tenseless verbs employed throughout. Even when Oppy tries to take account of tense, commenting, "Craig will resist this way of characterizing matters: given his view that the future is not real, he will insist that it is at best true that infinitely many slabs will be crossed: the collection that is formed here by successive addition is at best 'potentially infinite,'"[34] his inveterate habit of thinking in tenseless terms trips him up.[35] For if temporal becoming

is real, an infinite number of slabs will never be crossed: the finite series will just go on forever.[36]

How desperate, then, to attempt to refute the tensed time theorist's position by turning the man's task into a super-task, so that the slabs are crossed in progressively shorter intervals, the first in a half minute, the second in a quarter minute, the third in an eighth minute, and so on, so that at the end of one minute an actual infinity of slabs have been successively crossed! This is a fantasy that should not be taken seriously. That it is fantasy is evident in the fact that in all such scenarios the final state at ω + 1 is causally unconnected to the successive states in the ω series of states. Since there is no last term in the ω series, the state of reality at ω + 1 appears mysteriously from nowhere. The man (or a bouncing ball substituted for him) cannot reach the slab numbered ω + 1 without having stepped there from the immediately preceding slab. The absurdity of such supertasks underlines the metaphysical impossibility of trying to convert a potential into an actual infinite by successive addition.

Oppy responds, "But, of course, the assumption that there must be an *immediately* prior instant is precisely what proponents of the possibility of this kind of supertask deny: if time is a continuum, then there is no instant that is immediately prior to a given instant."[37] Here again we see the assumption that time may be adequately treated tenselessly as isomorphic to a line, an assumption which is false if temporal becoming is real. It is no accident that friends of super-tasks tend to be partisans of tenseless time. Moreover, their simply denying that there must be an immediately prior instant is hardly refutation of the claim that given a series formed throughout by successive addition the state of a physical object at ω + 1 must be causally connected with an immediately preceding state. Why else is the lamp, after an infinite series of successive switchings, on rather than off (or off rather than on) at ω + 1?

In any case, such super-tasks are not relevant to the argument under consideration, which concerns a collection of events which are all by definition equal in duration. Of course, the successive formation of the series of past events is not a case of beginning at some point and never ending but of the inverse, namely, never beginning but ending at some point. This strange case is reminiscent of Zeno's Dichotomy paradox and is featured in the thesis of Kant's First Antinomy concerning time, both of which I found insightful. Oppy, however, is considerably less enthusiastic: "there is nothing in either Zeno's paradoxes or the first Kantian antinomy," he says, to support (2.2).[38]

Curiously, however, Oppy in his discussion of the Dichotomy actually fails to say anything to resolve the paradox. He merely provides the customary mathematical analysis of the distance to be traversed during the time involved in terms of twin series of progressively shorter/briefer intervals converging to a point/instant at which Achilles is standing still prior to his run. Given that Achilles is standing still at the limit point/instant, "there is (of course) no first instant at which Achilles is in motion, and no first point that he moves to when he moves from the point at which he is at rest."[39] Zeno would agree! Oppy then simply declares, "But it would be a mistake to suppose that these considerations show that there cannot be motion—or change of state from being at rest to being in motion—if space and time have the structure of the real numbers."[40] This is settling the question by fiat. If we reject the Aristotelian analysis

of the spatial interval as divisible into potentially infinitely many subintervals rather than as compounded out of an actually infinite number of subintervals, and if we are taking tense seriously rather than treating time as a tenselessly existing extension, then it is devilish hard to see how Achilles can even move. Be that as it may, in the case of an infinite past, my point was that the temporal sub-intervals traversed are *not* converging toward a limit but are of equal duration, so that the usual "solutions" to the Dichotomy paradox become irrelevant. How an enduring object could live through an actually infinite number of, say, hours to arrive at the present hour remains mysterious.

Oppy's discussion of the thesis of Kant's First Antinomy concerning time is even less adequate. The question raised in the thesis concerning time is how an infinite temporal series can have been formed by successive synthesis. Oppy agrees that "The infinite series 1, 2, 3, . . . , *n*, . . . cannot be completed by successive synthesis, if what is required is that there should be a last member of the series that is reached by adding units."[41] But then he makes the remarkable suggestion:

> if we consider the very same series of elements in reverse order, ... *n*, . . . , 3, 2, 1, then we do have an infinite series that is completed by successive synthesis. Each member of the series is the successor of the immediately preceding element—reached by subtracting a unit—and there is a last element. If we understand the proposal that the world has no beginning in time to be the proposal that the series of states of the world is in one-one correspondence with the series . . . , *n*, . . . , 3, 2, 1, then Kant's key assumption [*viz*., that there cannot be an infinite series with a last member in which each member is the unique successor of some other member] seems to be a very crude begging of the main point at issue.[42]

The proposed mathematical analogy is clearly inapplicable to tensed time. For the present event to have been reached by the successive subtraction of prior events would require that the temporal series of events exist tenselessly and yet suffer progressive diminution by the beginningless attrition of events from the *earlier than* direction until the past has been entirely deleted, leaving us at the present event! It is not enough to put the series of past events into a tenseless one-to-one correspondence with some series of numbers. The question is how the series has been formed, and subtraction is clearly maladroit.

Now Oppy says that it would be "a very bad objection" to insist that successive synthesis requires addition rather than subtraction, so that Kant's argument is vindicated after all.[43] For "'Successive synthesis' requires no more than that each number of a series is derived in a law-governed fashion from the preceding member of the series."[44] Once again, we see the tendency of detensers to strip tensed notions of all tense and even temporality. Rooted in the long tradition of *kalām*, Kant's First Antinomy concerning time cannot be properly understood unless we recognize its use of irreducibly tensed concepts, particularly successive synthesis.

Finally, Oppy points out that if we do insist that an actually infinite series with a last member cannot be formed by successive addition as opposed to subtraction, then a different numerical series is available as a counter-example: . . . , -*n*, . . . , -3, -2, -1.

"In this series, each member is obtained from the preceding member by the addition of a unit: Successive synthesis if ever there were such a thing."[45] Oppy is correct in identifying the ordinal structure of the series of past events with that of the negative numbers, namely, ω*; but there is no successive synthesis among the timelessly existing members of the negative number series. Kant's worry about how the series of past events, having the ordinal type ω*, could be formed by adding one member after another is not even addressed, much less resolved.

The formation of an infinite series of past events by successive addition would be like someone's counting down all the negative numbers ending with 0 in the present. This happens to be one of the problem cases discussed by Oppy, so that it will repay effort to see what he has to say on that head. The bulk of his discussion, however, concerns the possibility of counting forwards to infinity, a discussion vitiated, as we have seen, by his assumption that if someone does not stop counting, then he does count to infinity. When he finally comes to the problem of counting backwards from infinity, Oppy is unusually concessive:

> even if something very much like counting forwards to infinity turns out to be unproblematic, it remains highly doubtful that anything like counting backwards from infinity is similarly unproblematic. All of the kinds of objections that were raised in connection with the Tristram Shandy case will arise here as well; we shall need a detailed examination of principles of sufficient reason in order to determine whether we should allow that it is possible that there be a creature that does something much like count backwards from infinity.[46]

Since the successive synthesis of an infinite past does, on Oppy's own analysis, involve something very much like counting down from infinity, it is hard to understand why he treats Kant's argument so dismissively.

Let us pursue Oppy's trail further, then, by examining his response to the Tristram Shandy case, which involves a man who writes his autobiography so slowly that it takes him a whole year to record the events of a single day. Suppose that Tristram Shandy has been writing from eternity past at the rate of one day per year. Robin Small has shown that if Tristram Shandy has been writing for an infinite number of years, then the most recent recorded day of his autobiography recedes to infinity, that is to say, to a day infinitely distant from the present.[47] Nowhere in the past at a finite distance from the present can we find a recorded day, for by now Tristram Shandy has fallen infinitely far behind. The beginningless, infinite series of days which he has recorded are days which lie at an infinite temporal distance from the present. But it is impossible to traverse the temporal interval from an infinitely distant event to the present, or, more accurately, for an event which was once present to recede to a point infinitely temporally distant.

In response, Oppy cautions that by adding further assumptions to the Tristram Shandy story we can, as with any story, generate an inconsistency, but that does nothing towards showing that it is impossible for the series of past events to be actually infinite. It is simply inconsistent, he claims, to suppose that Tristram Shandy is now writing

about any particular past day, treating the days as consecutive days. I am puzzled by Oppy's response, since Small's analysis did not try to identify which particular past day Tristram Shandy is presently recording but aimed to show merely that the recorded days lie at an infinite remove from the present. This is not in itself a contradiction. The infinite past must have in this case, not the order type ω^*, but the order type $\omega^* + \omega^*$, the order type of the series . . . , -3, -2, -1, . . . , -3, -2, -1. The problem rather is how one gets from the first series into the second by means of successive addition or temporal becoming. Oppy also rightly observes that it is the whole scenario which is impossible, which includes the requirement that consecutive days be recorded.[48] But given that the task of writing one's autobiography at the rate of one consecutive day per year seems obviously coherent, it seems that the blame must be placed on the assumption of the infinity of the past. What follows from the Tristram Shandy case, then, is that an infinite series of past events is absurd.

But suppose that such an infinite task could be completed by the present day. Here we encounter a problem that also arises with respect to the case of the person who claims to have been counting down from infinity and who is now finishing: . . . , -3, -2, -1, 0. We could ask, why did he not finish counting yesterday or the day before or the year before? If the person would have finished his countdown by today, then surely he would have finished it by yesterday, given that he has already had infinite time to complete the task.

Oppy's initial response to this question is very odd. He says that Tristram Shandy's writing (like the man's countdown) has from eternity past always been converging on a certain endpoint *T*. "In order for him to put down his pen [or cease counting] at some other time *T′* his writing [or counting] would need to have been converging on that other time."[49] This response amounts to no more than saying that it has always been true that the relevant person will finish his task at time *T*, which is a truism. But why will he finish at *T* rather than *T′*? Oppy answers that is not clear that this is a serious difficulty, for, he asks, why not suppose that Tristram Shandy's finishing when he does or the man's completing his countdown when he does is just "a brute feature of the scenario, that is, a feature that has no explanation?"[50] It has always been the case that he will finish when he does, but why the man finishes when he does rather than at some other time is just inexplicable.

Resting with inexplicability may seem unsatisfactory, however, especially in light of the respectable role such reasoning plays in scientific cosmological discussions. Oppy justifies his insouciance on the grounds that Principles of Sufficient Reason requiring that there be an explanation are highly contentious. Oppy elsewhere presents objections to various versions of the Principle of Sufficient Reason such as the impossibility of providing an explanation of what has been called the "Big Contingent Conjunctive Fact" (BCCF), which is the conjunction of all the contingent facts there are, or of libertarian free choices.[51] The problem with this justification, however, is twofold. First, plausible defenses of the Principle of Sufficient Reason can be given.[52] Oppy deems it "a delicate matter to discover a principle of sufficient reason that is both strong enough to yield the desired conclusion and yet not obviously in need of additional argumentative support."[53] Nonetheless, he himself thinks that it is "very

plausible" that there are acceptable instances of the following schema for a principle of sufficient reason:

> **O** (for every **FG** of kind K, there is an **F′G′** that *partly* explains why the **GF**s rather than **Q** possible alternatives),

where **O** is an operator like "necessarily," "it is knowable *a priori*," *etc*., **G** is an ontological category such as a proposition, state of affairs, *etc*., **F** is a restriction such as true, contingent, *etc*., and **Q** is a quantifier like "any," "every," *etc*.[54] But he thinks that it is not at all clear that there are acceptable instances of this schema that can be used to rule out scenarios like counting down from infinity. Although I am not sure what Oppy means by "**GF**s," the following principle would seem to be an instance of his schema:

> Necessarily, for any contingent state of affairs involving concrete objects there is a contingent state of affairs that partly explains why that state of affairs obtains rather than any other.

Such a principle would require that there be some partial explanation for why the man finishes his countdown today rather than at some other time. But, as we have seen, not even a partial explanation of why he finishes when he does can be given, for regardless of how we vary such factors as the rate of counting, they will be the same regardless of the time that he finishes and so do not furnish even a partial explanation of why he finishes today. So why is this instance of the schema not acceptable?

Second, and more to the point, there is no reason to think that requiring an explanation in the present case demands for its acceptability or plausibility the enunciation and defense of some general Principle of Sufficient Reason. Indeed, any such principle is apt to be tested inductively for its adequacy by whether cases like this constitute plausible counterexamples. The exceptions offered by Oppy, such as the inexplicability of the BCCF and libertarian choices, are simply irrelevant to the present case, for the BCCF is not at stake nor can a person counting from eternity at a constant rate choose arbitrarily when to finish his countdown. In the case under discussion we have a good reason to think that the man should have finished his countdown earlier than any time that he does, namely, he has already had infinite time to get the job done.[55] If we deny that infinite time is sufficient for completing the task, then we shall wonder why he is finishing today rather than tomorrow or the day after tomorrow, or, indeed, at any time in the potentially infinite future. It is not unreasonable to demand some sort of explanation for why, if he finishes today, he did not already finish yesterday. By contrast, if such a countdown is metaphysically impossible, then no such conundrum can arise. But clearly, there is no metaphysical impossibility in counting backwards for all time, unless time is past eternal. It follows that the past cannot be infinite.

Another problem case that arises in connection with (2.2) is what Oppy calls al-Ghazali's Problem. The great *mutakallim* envisions our solar system's existing from eternity past, the orbital periods of the planets being so co-ordinated that for every one orbit which Saturn completes Jupiter completes 2.5 times as many. If they

have been orbiting from eternity, he muses, which planet has completed the most orbits? The correct mathematical answer is that they have completed precisely the same number of orbits. But this seems absurd, for the longer they revolve the greater becomes the disparity between them, so that they progressively approach a limit at which Jupiter has fallen infinitely far behind Saturn. Yet, being now actually infinite, their respective completed orbits are somehow magically identical in number. Indeed, they will have "attained" infinity from eternity past: the number of completed orbits is always the same.

Oppy's discussion of al-Ghazali's problem fails to connect with the problem as I understand it, since Oppy, construing the problem tenselessly, takes its point to be that there is a logical contradiction with respect to the number of orbits completed, so that he spends most of his space arguing that given Cantorian assumptions there is no unequivocal sense in which the number of orbits both is and is not same.[56] Temporal becoming, which lies at the heart of the puzzle, is left wholly out of account. The longer the planets rotate the more the numbers of their respective orbits diverge, yet having now revolved for infinite time their orbits are numerically identical, which seems absurd.

For all of these reasons the formation of an actual infinite by successive addition is a notoriously difficult notion, even more so than the static existence of an actual infinite. Philosophers typically deal with the problem cases Oppy discusses only by treating time tenselessly. If we take tense seriously, as this second supporting argument does, then it is very difficult, indeed, to see how the series of past events can be actually infinite. So while the two metaphysical arguments on behalf of the second premise of the *kalām* cosmological argument may not approach Oppy's standard of being rationally coercive, they are strong enough, in the absence of countervailing arguments for the infinitude of the past, to warrant belief that the universe began to exist.[57]

Third supporting argument

We come now to the first physical supporting argument for (1.2), the evidence of the expansion of the universe. Oppy rightly points out that while non-initial stages of the expanding universe are well-described by current cosmological models, we still lack the marriage of General Relativity and Quantum Mechanics requisite for a description of the earliest stage of the universe. It is to Oppy's credit that he recognizes that such a description is *not* a necessary condition of having good scientific grounds for thinking that the universe began to exist. The history of twentieth century cosmogony has, in one sense, been a series of failed attempts to craft acceptable non-standard models of the expanding universe in such a way as to avert the absolute beginning predicted by the standard model. This parade of failures can be confusing to the layman, leading him mistakenly to infer that the field of cosmology is in constant flux, as new theories of the universe's origin continually come and go, with no assured results. In fact, the standard model's prediction of an absolute beginning has persisted through a century of astonishing progress in theoretical and observational cosmology and survived

an onslaught of alternative theories. With each successive failure of alternative cosmogonic theories to avoid the absolute beginning of the universe predicted by the standard model, that prediction has been corroborated.

A watershed of sorts appears to have been reached in 2003 with Arvind Borde, Alan Guth, and Alexander Vilenkin's formulation of a theorem establishing that any universe which has on average over its past history been in a state of cosmic expansion cannot be eternal in the past but must have a spacetime boundary.[58] Any universe which meets this condition cannot be extrapolated into the infinite past. Theorists intent on avoiding the absolute beginning of the universe could previously take refuge in the period prior to the Planck time, an era so poorly understood that one commentator has compared it with the regions on the maps of ancient cartographers marked "Here there be dragons!"—it could be filled with all sorts of chimaeras. But the Borde-Guth-Vilenkin theorem does not depend upon any particular physical description of the universe prior to the Planck time, being based instead on deceptively simple physical reasoning which will hold regardless of our uncertainty concerning that era. It single-handedly sweeps away the most important attempts to avoid the absolute beginning of the universe, in particular the hypothesis of an eternal inflationary multiverse and higher dimensional brane cosmologies. Vilenkin pulls no punches: "It is said that an argument is what convinces reasonable men and a proof is what it takes to convince even an unreasonable man. With the proof now in place, cosmologists can no longer hide behind the possibility of a past-eternal universe. There is no escape, they have to face the problem of a cosmic beginning."[59] The Borde-Guth-Vilenkin theorem is now widely accepted by cosmologists. As a result, theorists who would avert the beginning of the universe are forced to deny the single assumption of that theorem: that the universe's history has been one of cosmic expansion. Although speculative models of the universe have been crafted on the assumption that that condition is not met, such models encounter daunting difficulties, both observationally and theoretically.[60]

Nevertheless, Oppy expresses four reasons to be "cautious." Now the admonition to be cautious is one with which no one would disagree. But an examination of Oppy's four reasons suggests that he is not being cautious but is rather making a determined effort to avoid the drift of the evidence. His first two reasons concern the initial cosmological singularity found in the standard model. In dependence upon John Earman's study of singularities in General Relativistic spacetimes,[61] Oppy notes that whether the spacetime metric is extendible through an initial singularity depends on certain mathematical conditions placed on that metric. This hardly constitutes a reason for caution, however, since such conditions are virtually universally accepted by physicists as part of physically meaningful cosmogony. The point of Earman's discussion is to show that "under plausible constraints on what is to be counted as a physically meaningful extension, there are no physically meaningful extensions through the big bang of the standard models."[62] The presence of an initial cosmological singularity is uncontroversially taken to preclude spacetime's extendibility to prior times.

Second, Oppy seeks to capitalize on Earman's remark that "Even if my argument succeeds, it remains open that there is some mathematically meaningful extension—involving lower continuity/differentiability conditions than those required for a physically

meaningful extension—and that God or some other metaphysical cause operates in this mathematical time."[63] Earman does not take this idea seriously,[64] but Oppy suggests that the hypothesis that God operates in a prior metaphysical time to create the universe leaves room for the suggestion that there is some other cause of the universe which "is part of an infinite regress of contingent causes."[65] Then there is nothing in the empirical evidence for a singular beginning of spacetime to rule out the claim that there is an infinite regress of prior contingent causes. I must confess that I have no idea at all what Oppy is talking about. Such a purely mathematical extension is physically impossible, so that the entities of that prior regime are presumably abstract objects which cannot by their very nature stand in causal series. In any case, Oppy's postulation of a prior regime of temporally ordered contingent causes is an exercise in metaphysics, and to advert to metaphysics at this point just is to admit that the scientific evidence supports (1.2).

In the end Oppy's real point in mentioning these exotic possibilities is to say that in light of such possibilities we are "far from having good reason" to suppose that quantum gravitational replacements of the standard model will feature an absolute beginning of the physical universe, or at least of the contingent universe. This inference is multiply confused. First, any hypotheses on which quantum gravity models might be extended into the infinite past have absolutely nothing to do with the two possibilities mentioned by Oppy. Indeed, quantum gravity models typically have non-singular origins, so that there is no question of trying to extend spacetime metric through a singularity. Second, the suggestion that the physical universe may have an absolute beginning but that the contingent universe (presumably that series of contingent causes prior to the singularity) does not draw a distinction foreign to physical cosmology and therefore plays no role in quantum cosmology. Any such speculation is metaphysical. Third, most of the models of the three major research programmes being pursued in quantum gravity today—string theory, loop quantum gravity, and semi-classical approaches like the Hartle-Hawking and Vilenkin models—are not past eternal but involve an absolute beginning of the universe, as in the standard model. Finally, fourth, the Borde-Guth-Vilenkin theorem gives us, as we have seen, good reason to think that tenable quantum gravitational replacements of the standard model will not be past eternal.

The third reason Oppy gives for exercising caution is that "in the standard Big Bang models, for every time t , there is an earlier time t', and the state of the universe at t' is a causal determinant of the state of the universe at t. Thus, it turns out that even in the standard Big Bang models, there is no 'absolute beginning' of the physical universe."[66] The salient point is that since the spacetime metric cannot be extended all the way to t=0, the universe lacks a beginning point. Hence, the universe did not, despite its past temporal finitude, begin to exist.[67]

The fundamental shortcoming of this objection is its assumption that having a beginning entails having a beginning point. This is not, in fact, how the locution "begins to exist" is typically understood. For one thing, the proposed definition commits us to the reality of points, which surely overloads the expression "begins to exist" with unintended ontological commitments. Moreover, the use of the expression in astrophysical cosmogony belies the supposed entailment. Contemporary cosmologists frequently "cut out" the initial cosmological singularity as a merely ideal point on the

boundary of spacetime so that the universe has no beginning point of its existence; but they do not therefore think that the universe no longer begins to exist or that the mystery of the origin of the universe has thereby been solved. Rather the key idea in having a beginning is past metrical finitude. Time may be said to begin to exist just in case for any non-zero, finite interval of time that one picks, there are only a finite number of congruent intervals earlier than it. Or, alternatively, time begins to exist just in case for some specified non-zero, finite interval of time, there are no congruent intervals earlier than it. On either explication beginning to exist does not entail having a beginning point.[68] Oppy's third worry therefore need not trouble us.

Oppy's fourth reason for caution is that if we concede, as seems right, that the physical universe is finite in the past and so in this sense "begins to exist," then the question is whether the first premise of the *kalām* cosmological argument is true under this interpretation of "begins to exist." Is it true that everything with a finite past has a cause? Having little confidence in his foregoing worries, Oppy now agrees that the physical universe probably is finite in the past but thinks that the universe might have come into being uncaused.

Why does he think that? Oppy later explains that if we adopt Grünbaum's explication of "object x begins to exist at time t," then the *kalām* cosmological argument "is in ruins."[69] The *mutakallim* will be unfazed by this conclusion, however, since Grünbaum's explication is patently inadequate, not to say irrelevant. For, according to Grünbaum, x begins to exist at t just in case (i) x exists at t, (ii) there are times prior to t, and (iii) there is no time prior to t at which x exists. This would exclude by definition that time began to exist, a negative conclusion which is contrary to physical cosmogony and which ought not in any case to be settled by mere definition.

Oppy argues that on my own explication of "x begins to exist at t" the beleaguered *kalām* cosmological argument still "is in ruins"[70]—that is, if we assume that an object begins to exist if and only if there is some time (that is, instant) at which it begins to exist. For I amend Grünbaum's account in such a way that "x begins to exist at t" just in case (i) x exists at t and (ii) there is no time prior to t at which x exists. If we do not accord any reality to t=0, observes Oppy, then the universe on this account does not begin to exist. But, of course, I simply reject the gratuitous assumption that something's beginning to exist implies its beginning to exist at t, at least if t ranges only over instants. If t ranges over non-zero finite intervals as well, then the explication is both adequate and unproblematic.[71] The question, then, to be taken up below, is whether the causal premise of the *kalām* cosmological argument is more plausibly true than false under such an understanding of "begins to exist."

In sum, Oppy's treatment of the scientific evidence for the universe's beginning from the expansion of the universe reveals a determined scepticism. He draws sceptical conclusions from worries that the community of contemporary cosmologists does not share. He assumes, contrary to normal and scientific usage, that beginning to exist entails having a beginning point. Even conceding that the physical universe probably is finite in the past, he is sceptical that there need be a cause of the universe's coming into being. In short, he does not give good grounds for resisting the evidence from contemporary cosmology for the second premise of the *kalām* cosmological argument.

Fourth supporting argument

The second supporting scientific argument for the universe's beginning is based on the thermodynamic properties of the universe. In a certain respect, the evidence of thermodynamics is even more impressive than the evidence afforded by the expansion of the universe, for while an accurate physical description of the universe prior to the Planck time remains and perhaps always will remain unknown, thereby affording room for speculations aimed at averting the origin of time and space implied by the expanding cosmos, no such uncertainty attends the laws of thermodynamics and their application. Indeed, thermodynamics is so well-established that this field is virtually a closed science.[72]

Already in the nineteenth century, physicists realized that the application of the Second Law of Thermodynamics to the universe as a whole implied a grim eschatological conclusion: given sufficient time, the universe will eventually come to a state of equilibrium and suffer "heat death." But this apparently firm projection raised an even deeper question: if, given sufficient time, the universe will suffer heat death, then why, if it has existed forever, is it not now in a state of heat death? The advent of relativity theory and its application to cosmology altered the shape of the eschatological scenario predicted on the basis of the Second Law but did not materially affect the fundamental question. In contrast to their nineteenth century forebears, contemporary physicists have come to question the implicit assumption that the universe is past eternal. P. C. W. Davies concludes, "The universe can't have existed forever. We know there must have been an absolute beginning a finite time ago."[73]

Oppy gives short shrift to the evidence of thermodynamics. This is unfortunate because this field continues to generate a good deal of discussion in contemporary cosmology. Very recent discoveries provide strong evidence that there is effectively a positive cosmological constant which causes the cosmic expansion to accelerate rather than decelerate. Paradoxically, since the volume of space increases exponentially, allowing greater room for further entropy production, the universe actually grows farther and farther from an equilibrium state as time proceeds. But the acceleration only hastens the cosmos's disintegration into increasingly isolated material patches no longer causally connected with similarly marooned remnants of the expanding universe. Each of these patches faces, in turn, thermodynamic extinction. Thus, the same pointed question raised by classical physics persists: why, if the universe has existed forever, is it not now in a cold, dark, dilute, and lifeless state?

If we postulate the finitude of past time and space, such problems are avoided. The reason for the observed disequilibrium state is that spacetime had an absolute beginning in a low entropy condition a finite time ago and is on its way towards states of increasing disorder.

Oppy dismisses the evidence of thermodynamics for two reasons: (i) "thermodynamical considerations can establish only that the *physical* universe is finite in the past: they cannot establish that there is no infinite regress in the *contingent* universe"; and (ii) "neither can they establish that there was an initial state of the universe at t=0."[74] These reasons are very weak. With respect to (i), insofar as Oppy

draws a distinction between the physical universe and the contingent universe, he is introducing a distinction which is foreign to astrophysical cosmology, not to say altogether mysterious. It just is to admit that the evidence of thermodynamics shows that the universe is not past eternal. As for (ii), there is neither interest in nor necessity of showing that t=0 was an initial state of the universe. Oppy implicitly admits that thermodynamical considerations do show that the universe began to exist in that past time is metrically finite, and so he is forced to deny, not the second, but the first premise of the *kalām* cosmological argument.

In sum, whatever we think of the metaphysical arguments for the finitude of the series of past events, we have good scientific evidence for the beginning of the universe. Of course, by its very nature scientific evidence is always provisional and so never rationally compelling, as Oppy requires; still it cannot be said that contemporary cosmology gives "no good reason" to suppose that the universe had an absolute beginning.

It seems to me therefore that the case for the crucial premise of the *kalām* cosmological argument is considerably stronger than Oppy would have us believe. No reason, much less good reason, has been given to think that the universe is infinite in the past. On the contrary, the idea of a temporal series of events infinite in the past and formed by successive addition is deeply problematic. Physical cosmologists themselves are beginning to recognize the force of these metaphysical problems.[75] For example, Ellis, Kirchner, and Stoeger ask, "Can there be an infinite set of really existing universes? We suggest that, on the basis of well-known *philosophical* arguments, the answer is No."[76] Similarly, noting that an actual infinite is not constructible and therefore not actualizable, they assert, "This is precisely why a realized past infinity in time is not considered possible from this standpoint—since it involves an infinite set of completed events or moments."[77] These misgivings represent endorsements of both of the *kalām* arguments which I defended above. Ellis and his colleagues conclude, "The arguments against an infinite past time are strong—it's simply not constructible in terms of events or instants of time, besides being conceptually indefinite."[78]

Arguments for the first premise

So if Oppy's scepticism concerning the *kalām* cosmological argument is to be justified, he must fall back onto his critique of the first premise, that *everything that begins to exist has a cause*. This premise strikes me as obviously true—at least, more so than its negation. First and foremost, it is rooted in the metaphysical intuition that something cannot come into being from nothing. To suggest that things could just pop into being uncaused out of nothing is to quit doing serious metaphysics and to resort to magic. Second, if things really could come into being uncaused out of nothing, then it becomes inexplicable why just anything or everything does not come into existence uncaused from nothing. Finally, the first premise is constantly confirmed in our experience. Non-theists who are scientific naturalists thus have the strongest of motivations to accept it.

Experiential support for the first premise

Oppy's scepticism extends to this first premise as well. First, he questions what it means to "begin to exist." I take it that he intends here to resume the discussion of the fourth caution concerning the physical evidence for the beginning of the universe. There, we recall, Oppy conceded that the universe began to exist in the sense of being finite in the past but expressed doubt that a universe which began to exist in that sense must have a cause. Adverting to my explication of "*x* begins to exist at *t*," Oppy questions my claim that we have strong empirical support for premise (1.1). Remarkably, he says that the answer is "plainly negative."[79] How does he justify this surprising verdict? He explains, "In experience, we only ever meet with objects whose coming into existence is preceded by times at which those objects do not exist. Nothing in experience bears on the question of the causal antecedents of objects that begin to exist at *t*=0."[80]

This objection to the evidentiary support for (1.1) is multiply confused. First, if, following Oppy's lead, we substitute for (1.1)

1.1′. Everything that begins to exist at *t* has a cause,

then the *kalām* cosmological argument becomes plainly invalid, since I deny that "*x* begins to exist" entails "*x* begins to exist at *t*." If we try to make the argument valid by substituting for (1.2)

1.2′. The universe began to exist at *t*,

then (1.2′) is plausibly false, since *t*=0 is plausibly at most an ideal point. The question rather is simply whether everything that begins to exist has a cause, and experience uniformly supports this truth. We never experience things popping into being without a cause. Oppy is willing to concede that the universe began to exist in the sense that it is finite in the past. Our experience also uniformly supports the proposition that everything that is finite in the past has a cause.

Second, in any case, surely experience does support the judgement that if something exists at a time *t* and there is no time prior to *t* at which the thing exists, then the thing has a cause. My explication of "*x* begins to exist at *t*" leaves it an open question whether there are times prior to *t* or not. For all we know from (1.1), there may be no times not preceded by other times. So Oppy has no grounds for denying that the evidence does support the truth of (1.1) so understood. What that implies about the temporal status of the cause of the universe inferred from the conjunction of (1.1) and (1.2) is a question for subsequent discussion. Of course, we have no direct experience of *t*=0, nor, for that matter, of most other times in the history of the universe; but if Oppy wants to defeat the evidence for (1.1), he needs to present some reason to think that the difference between those times and the times we do experience is not merely an accidental feature of those times irrelevant to whether things can pop into being uncaused at those times or whether there is a difference that renders those times somehow such that things can come into being without causes at those but not at other times. He has said nothing to make it plausible or even credible that *t*=0 is essentially different from other times in this respect. Hence, Oppy is mistaken when he concludes that the experiential support for (1.1) is "extremely weak."[81]

Obviousness of the first premise

Oppy then turns his critical eye toward my claim that (1.1) is obviously true. First, Oppy objects that if conceivability is a good guide to metaphysical possibility, then it seems undeniable that it is possible for there to be a universe without a cause. He does not respond, however, to my (or, really, Anscombe's) point in *The Kalām Cosmological Argument* that there is a difference between mere imaginability and conceivability.[82] I should say that the picture of a universe popping into being without a cause is mere imagination. But notice here that I presuppose once more that in beginning to exist the universe literally came into being. I suspect that Oppy, like certain other tenseless time theorists who have objected to (1.1), finds the notion of an uncaused beginning unproblematic because, given their background beliefs about the mind-dependence of becoming, something's beginning to exist does not entail something's coming into being but its merely having finite, tenseless extension in the *earlier than* direction. Perhaps this also bears on why Oppy thinks that something which begins to exist in the sense that it is finite in the past needs no cause of its beginning to exist.

Second, although Oppy thinks that "hard questions" need to be asked about the meaning of "cause" in (1.1),[83] his real concern turns out to be what is meant by a "thing." If we understand things to be individual particulars and the like, he says, then it "is worth asking" why we should suppose that (1.1) is worthy of belief, when more extensive Principles of Sufficient Reason are not.[84] I have already given three reasons why (1.1) is worthy of belief, and Oppy has given reasons for challenging more extensive Principles of Sufficient Reason. The counterexamples to the more extensive principles are not counterexamples to the more modest (1.1). While we could argue *a fortiori* from the stronger principles to (1.1), there is no reason to think the falsity of the more ambitious principles implies the falsity of the more circumspect (1.1). Oppy objects that the reasons I give for believing (1.1) support just as strongly the more extensive principles, so that if the reasons fail to make those principles worthy of belief, neither do they render (1.1) worthy of belief. I think it is evident, however, that the reasons I gave for accepting (1.1) are not equally strong reasons for supposing that, for example, the BCCF has an explanation or that the state of affairs of my freely choosing to perform some action has an explanation. It would be reckless to infer that because these states of affairs do not have any explanation that concrete objects can pop into being uncaused.

Third, Oppy envisions a scenario according to which there might be different products of indeterministic particle decay. While it is clear that there would be a material cause of those products, it is not obvious, he opines, that they would have an efficient cause. Oppy does not claim that it is clear that such products would have no efficient cause (maybe there are indeterministically operating efficient causes), but he does think that before we can assent to the claim that everything that begins to exist has an efficient cause for its coming into existence, we need to be told "a lot more about the analysis of efficient causation."[85] Absent such an analysis, it is "not the least bit obvious" that everything that begins to exist has an efficient cause of its beginning to exist.[86]

I myself think that it is far more obvious that (1.1) is true than that Oppy's scenario constitutes a *bona fide* counterexample. It seems to me that the particle which decays is an indeterministic efficient cause of the products of decay. Indeed, I should venture to say that while one might have efficient causation without material causation, as, for example, in mental acts of creation, it is impossible to have material causation without efficient causation, since the thing originally constituted by the matter is the efficient cause of the effect. Be that as it may, if one does find Oppy's objection compelling, one could avoid his objection by substituting a less ambitious premise for the causal principle enunciated in (1.1), for example,

1.1.″ If the universe began to exist, then the universe has a cause.

In that case Oppy's counterexample would be irrelevant, and an efficient cause of the universe would be required, if by "cause" we understood "efficient cause."

In point of fact, however, (1.1) does not state that the cause of something which begins to exist is an efficient cause. For all we know, it could be either an efficient or a material cause. It is only with argument's conclusion that the *mutakallim* will argue that the cause of the universe must by its very nature be an immaterial being, since it created all of physical reality. Oppy takes cognizance of this point in a footnote but objects that if "cause" in (1.2) means "either an efficient or a material cause," then "one could not argue for the existence of an immaterial God on the basis of this premise."[87] This intrusion of theological concerns is not only irrelevant to the obviousness or truth of the premise, but also wrong-headed, for one does not argue on the basis of (1.1) for the immateriality of the First Cause, since many efficient causes are material. Rather it is on the basis of a conceptual analysis of "cause of the universe" that one is able to deduce many of the significant properties of the First Cause reached in the argument's conclusion, including its immateriality.[88] Oppy notes that if one draws merely the conclusion that there is either an efficient or a material cause of the universe, then one will need further supporting argument to get to the claim that the universe has an efficient cause. This is the case, however, only if one presupposes that material causation can exist without efficient causation; but if it can, then a simple disjunctive syllogism will do the trick, since the universe cannot have a material cause. In any case, what should not go unnoticed is that Oppy has quietly abandoned his claim that the causal premise, so understood, is not obviously true. This puts Oppy in the awkward position of having now conceded, at least tacitly, that the second premise of the *kalām* cosmological argument is probably true and its first premise obviously true.

The above response answers Oppy's third objection; but I think that there is something more to be said here about Oppy's claim. Oppy's strategy throughout his book seems to be to raise so many philosophical conundrums that the sceptic can take refuge in unanswered questions. At the end of his chapter on cosmological arguments alone Oppy has no less than six pages of questions that need to be answered in the analysis of cosmological arguments, including eight philosophically difficult, multi-faceted questions about the nature of causation (and there are more, he assures us, not mentioned!). There is something perverse about this way of doing philosophy. If we had to have all our philosophical questions answered first, we should scarcely be warranted in believing anything. A principle so perspicuous as "Everything that begins to exist

has a cause" can be rationally accepted prior to the resolution of every philosophical conundrum about causation. Of course, if specific defeaters are brought against it, then one needs to rebut or undercut them; but that is a quite different project than requiring answers to profound philosophical questions prior to our justifiably believing it. Of course, Oppy might retort that he is not denying that the causal principle is rationally acceptable on the grounds that have been given but merely insisting that it is not rationally obligatory. But then we come back full circle to the unrealistic standards Oppy sets for what constitutes a good argument.[89]

Notes

1 Quentin Smith reports, "a count of the articles in the philosophy journals shows that more articles have been published about Craig's defense of the Kalam argument than have been published about any other philosopher's contemporary formulation of an argument for God's existence" (Quentin Smith, "*Kalam* Cosmological Arguments for Atheism," in *The Cambridge Companion to Atheism*, ed. Michael Martin, Cambridge Companions to Philosophy [Cambridge: Cambridge University Press, 2007], p. 183).

2 See his *Arguing about Gods* (Cambridge: Cambridge University Press, 2006), pp. 137-54, which presupposes his *Philosophical Perspectives on Infinity* (Cambridge: Cambridge University Press, 2006).

3 See Oppy, *Arguing about Gods,* pp. 7-13.

4 See, *e.g.*, William Lane Craig, critical notice of *Arguing about Gods*, by Graham Oppy, *Philosophia Christi* 10 (2008): 435-42.

5 Oppy, *Arguing about Gods,* p. 142. *Cf.* "This seems right: an infinite number of events stretching back into the past would form an actually infinite set, as would an infinite number of events stretching into the future" (Ibid., p. 141).

6 Ibid., p. 141.

7 Ibid., p. 142.

8 Ibid., p. 141.

9 Ibid., p. 142.

10 Ibid., p. 141.

11 Oppy, *Philosophical Perspectives on Infinity,* pp. 261-4; cf. pp. 244-5

12 Ibid., pp. 242-3.

13 Ibid., p. 260.

14 Ibid., pp. 291-3.

15 Ibid., p. 293.

16 Ibid.

17 William Lane Craig, *The Kalam Cosmological Argument* (London: Macmillan, 1979), p. 69.

18 Oppy, *Arguing about Gods,* p. 140; *cf.* p. 139.

19 See William Alston, "Does God Have Beliefs?" *Religious Studies* 22 (1986): 287-306; Thomas P. Flint and Alfred J. Freddoso, "Maximal Power," in *The Existence and Nature of God,* ed. Alfred J. Freddoso (Notre Dame: University of Notre Dame Press, 1983), pp. 81-113.

20 Here, again, we touch on a very subtle point concerning what constitutes a "good" argument. Oppy considers only arguments which are rationally compelling in a strong sense to be any good. But he confuses an argument's being good in this sense with the argument's proponent's being able to prove that his argument is good. The claim that one's argument is good is a meta-claim about the argument's claims. One can coherently present one's argument with the conviction that others ought to accept it without thinking that one can show that they ought to accept it. If someone's intuitions were so defective, for example, that he failed to see that something cannot be simultaneously red all over and green all over, then his denial would be irrational even if we could not prove that it is irrational.

21 José A. Benardete, *Infinity: An Essay in Metaphysics* (Oxford: Clarendon Press, 1964), p. 238. He has in mind especially what he calls paradoxes of the serrated continuum, such as the following:

> "Here is a book lying on the table. Open it. Look at the first page. Measure its thickness. It is very thick indeed for a single sheet of paper—1/2 inch thick. Now turn to the second page of the book. How thick is this second sheet of paper? 1/4 inch thick. And the third page of the book, how thick is this third sheet of paper? 1/8 inch thick, &c. *ad infinitum*. We are to posit not only that each page of the book is followed by an immediate successor the thickness of which is one-half that of the immediately preceding page but also (and this is not unimportant) that each page is separated from page 1 by a finite number of pages. These two conditions are logically compatible: there is no certifiable contradiction in their joint assertion. But they mutually entail that there is no last page in the book. Close the book. Turn it over so that the front cover of the book is now lying face down upon the table. Now—slowly—lift the back cover of the book with the aim of exposing to view the stack of pages lying beneath it. *There is nothing to see*. For there is no last page in the book to meet our gaze" (Ibid., pp. 236-237).

To my mind this conclusion itself is evidently metaphysically absurd. Although Oppy, following A. Hazen, offers expansions of the story so that someone opening the book will have some sort of visual experience, rather than as it were, a blank (Oppy, *Philosophical Perspectives on Infinity*, pp. 83-5), that does not negate the conclusion that there is nothing there to see, since there is no last page. Benardete imagines what would happen if we tried to touch the last page of the book. We cannot do it. Either there will be an impenetrable barrier at + 1, which seems like science fiction, or else our fingers will penetrate through an infinity of pages without first penetrating a page, which recalls Zeno's paradoxes in spades, since the pages are actual entities. What makes paradoxes like these especially powerful, as Benardete points out, is that no process or supertask is involved here; each page is an actual entity having a finite thickness (none has the measure of a degenerate interval) which could be unbound from the others and all the pages scattered to the four winds, so that an actual infinity of pages would exist throughout space. If such a book cannot exist, therefore, neither can an actual infinite.

22 Oppy, *Arguing about Gods*, p. 140.

23 As Oppy observes, my illustration of an infinite library does not raise any issues not involved in the more engaging illustration of Hilbert's Hotel.

24 Oppy, *Philosophical Perspectives on Infinity*, p. 48.

25 Ibid., p. 53.
26 Ibid., p. 48.
27 Oppy suggests using J. Conway's recently developed constructions called surreal numbers to define operations of subtraction and division of transfinite numbers (Oppy, *Arguing about Gods*, p. 140); but he explicitly denies that such non-canonical theories can be applied "to real-world problems, if one wishes to treat one's models with full ontological seriousness" (Oppy, *Philosophical Perspectives on Infinity*, p. 272). Oppy does not show, nor does he think, that the results of operations on surreals would be any less counter-intuitive when translated into the concrete realm.
28 Oppy, *Arguing about Gods*, p. 144.
29 Ibid., p. 143.
30 William Lane Craig, "The Cosmological Argument," in *The Rationality of Theism*, ed. Paul Copan and Paul K. Moser (London: Routledge, 2003), p. 120.
31 William Lane Craig, *The Tensed Theory of Time: a Critical Examination,* Synthese Library 293 (Dordrecht: Kluwer Academic Publishers, 2000); idem, *The Tenseless Theory of Time: a Critical Examination,* Synthese Library 294 (Dordrecht: Kluwer Academic Publishers, 2000).
32 William Lane Craig, "The Extent of the Present," *International Studies in the Philosophy of Science* 14 (2000): 165-185. Consider also in this connection the many variations on the Grim Reaper Paradox (Benardete, *Infinity*, pp. 259-61; Oppy *Philosophical Perspectives on Infinity*, pp. 63-6, 81-83; Jonathan Hawthorne, "Before-effect and Zeno causality," *Noûs* 34 [2000]: 622-33). There are denumerably infinitely many Grim Reapers (whom we may identify as gods, so as to forestall any kinematic objections). You are alive at 12:00 p.m. Grim Reaper 1 will strike you dead at 1:00 p.m. if you are still alive at that time. Grim Reaper 2 will strike you dead at 12:30 p.m. if you are still alive then. Grim Reaper 3 will strike you dead at 12:15 p.m., and so on. Such a situation seems clearly conceivable but leads to an impossibility: you cannot survive past 12:00 p.m. and yet you cannot be killed at any time past 12:00 p.m. Oppy's solution to a similar paradox concerning infinitely many deafening peals, *viz*. that there is no particular peal responsible for your deafness but that the collective effect of infinitely many peals is to bring about deafness, not only involves a most bizarre form of retro-causation but is in any case inapplicable to the Grim Reaper version, since once you are dead no further Grim Reaper will swing his scythe, so that collective action is out of the question. The most plausible way to avert such paradoxes is by denying that time and space are constructions out of an actually infinite number of points. (My thanks to Alexander Pruss for drawing my attention to this version of the paradox.)
33 Oppy, *Arguing about Gods*, p. 143.
34 Ibid.
35 Oppy's understanding of the potential infinite is not the customary notion of a limit concept; rather he construes it modally. A potential infinitist in the realm of ontology, he says, is one who is committed to the truth of claims of the form, that is to say, claims to the effect that for any natural number there is a possible world in which that number of objects exists, but who denies the truth of any claim of the form, that is to say, any claim to the effect that there is a possible world in which there are as many objects as all the natural numbers. A major shortcoming of these characterizations is that they are *tenseless* and so incapable of handling views of time which regard tense

and temporal becoming as objective features of reality and, hence, worlds in which the future is potentially infinite in the sense of growing toward infinity as a limit.

36 Similarly, Oppy's earlier discussion of counting to infinity is predicated upon Dretske's assumption that if one never stops counting, then one does count to infinity (Oppy, *Philosophical Perspectives on Infinity*, p. 61). Oppy fails so much as to mention, much less take account of, the difference between an actual and a potential infinite in this case. One who, having begun, never stops counting counts "to infinity" only in the sense that one counts potentially infinitely.

37 Oppy, *Arguing about Gods*, p. 144.

38 Ibid., p. 144.

39 Oppy, *Philosophical Perspectives on Infinity*, p. 97.

40 Ibid.

41 Ibid., p. 116.

42 Ibid., pp. 116-7.

43 Ibid., p. 117.

44 Ibid.

45 Ibid.

46 Ibid., p. 63.

47 Robin Small, "Tristram Shandy's Last Page," *British Journal for the Philosophy of Science* 37 (1986): 213-16.

48 Oppy, *Philosophical Perspectives on Infinity*, p. 57, n. 3.

49 Ibid., p. 59.

50 Ibid.; *cf*. p. 63; Oppy, *Arguing about Gods*, pp. 141-2.

51 Oppy, *Philosophical Perspectives on Infinity*, pp. 279-80.

52 See Alexander Pruss, *The Principle of Sufficient Reason: A Reassessment,* Cambridge Studies in Philosophy (Cambridge: Cambridge University Press, 2006).

53 Oppy, *Arguing about Gods*, p. 141-2.

54 Oppy, *Philosophical Perspectives on Infinity*, p. 285, *cf.* pp. 275-6.

55 Notice, too, that if there is *any* probability of his finishing in infinite time, then he will have already finished.

56 Oppy, *Philosophical Perspectives on Infinity*, pp. 8, 49-51.

57 It is noteworthy that Oppy agrees that if the temporal series of past events is not actually infinite, then the conclusion follows that the universe is itself finite in the past (Oppy, *Arguing about Gods*, p. 142), which fact implies that the universe began to exist.

58 Arvind Borde, Alan Guth, and Alexander Vilenkin, "Inflation Is Not Past-Eternal," http://arXiv:gr-qc/0110012v1 (1 Oct 2001): 4. The article was updated in January 2003.

59 Alex Vilenkin, *Many Worlds in One: The Search for Other Universes* (New York: Hill and Wang, 2006), p. 176.

60 See discussion in William Lane Craig and James Sinclair, "The *Kalam* Cosmological Argument," in *Blackwell Companion to Natural Theology*, ed. Wm. L. Craig and J. P. Moreland (Oxford: Blackwell, 2009), pp. 125-82.

61 John Earman, *Bangs, Crunches, Shrieks, and Whimpers: Singularities and Acausalities in Relativistic Spacetimes* (New York: Oxford University Press, 1995), chap. 7.

62 Ibid., p. 207.

63 Ibid.

64 Ibid., p. 210.

65 Oppy, *Arguing about Gods*, p. 146.

66 Oppy, *Arguing about Gods*, p. 147. Oppy overlooks the fact that Earman, from whom he borrows this point, confines his discussion to classical General Relativistic spacetimes only and so takes no cognisance of quantum physical effects.

67 But see the different take on the objection by Quentin Smith: he holds that the initial singular point of the universe is not real and that therefore the sequence of instantaneous states of the universe is a beginningless series converging toward zero as a limit. Each state is caused by its predecessor and there is no first state. But any initial non-zero interval or state, such as the first second of the universe's existence, "is not caused by any or all of its instantaneous states and is not caused by any external cause" (Quentin Smith, "*Kalam* Cosmological Arguments for Atheism," in *The Cambridge Companion to Atheism*, ed. Michael Martin, Cambridge Companions to Philosophy [Cambridge: Cambridge University Press, 2007], p. 189). Smith takes "the beginning of the universe" to refer to the Planck era, that state which lasts until 10^{-43} second after the singularity. As a state of non-zero duration, the beginning of the universe therefore has no cause of any sort. The universe therefore comes into being uncaused out of nothing.

68 Earman tacitly concedes the adequacy of this reply, objecting instead that in that case the premise "Whatever begins to exist has a cause" is not an obvious "metaphysical truth," since it is not a consequence of "Every event has a cause" (Earman, *Bangs, Crunches, Shrieks*, p. 208). I do not think our confidence in the former truth is in any way based upon the less obvious entailing claim.

69 Oppy, *Arguing about Gods*, p. 149.

70 Ibid.

71 Oppy himself provides an explication that takes account of non-zero finite intervals of time by suggesting that x begins to exist at t just in case x exists at all times in some open or closed interval $(t, t'>t)$ and x exists at no times in any open interval $(t''<t, t)$. In that case, even if $t=0$ is unreal, the universe began to exist. But he thinks that we have no empirical evidence for the premise that everything that begins to exist in this sense has a cause.

72 One recalls Eddington's remark: "The second law of thermodynamics holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation, well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but collapse in deepest humiliation" (Arthur S. Eddington, *The Nature of the Physical World* [New York: Macmillan], p. 74).

73 Paul Davies, "The Big Questions: In the Beginning," ABC Science Online, interview with Phillip Adams, http://aca.mq.edu.au/pdavieshtml. *Cf.* P. C. W. Davies, *The Physics of Time Asymmetry* (London: Surrey University Press, 1974), p. 104.

74 Oppy, *Arguing about Gods*, p. 148.

75 Besides the paper by Ellis *et al.* cited below, see also Rüdiger Vaas, "Time before Time: Classifications of universes in contemporary cosmology, and how to avoid the antinomy of the beginning and eternity of the world," http://arXiv.org/abs/physics/0408111 (2004).

76 G. F. R. Ellis, U. Kirchner, and W. R. Stoeger, "Multiverses and Physical Cosmology," http://arXiv:astro-ph/0305292 v3 (28 August 2003), p. 14 (my emphasis).

77 Ibid.

78 Ibid.
79 Oppy, *Arguing about Gods*, p. 149.
80 Ibid.
81 As Oppy notes, I also floated an argument for the causal principle based on a Kantian *a priori* category. I have not given any more thought to this suggestion and so shall not pursue it here.
82 Craig, *Kalam Cosmological Argument*, pp. 144-5.
83 Oppy, *Arguing about Gods*, p. 151. I shall therefore ignore Oppy's misconstruing the causal principle in terms of event/event causation, since he does not seem to exploit the analysis. Suffice it to say that (1.1) does not require that every event have a cause.
84 Oppy, *Arguing about Gods,* p. 152.
85 Ibid.
86 Ibid., p. 153.
87 Ibid.
88 Craig, "Cosmological Argument," pp. 128-9.
89 I am indebted to Graham Oppy for discussion of several issues discussed in this exchange.

9

Heartbreak At Hilbert's Hotel

Landon Hedrick

For more than three decades, William Lane Craig has been the leading proponent of the *kalām* cosmological argument for the existence of God. The argument is formulated as follows[1] (Craig (2008a), 111):

1. Whatever begins to exist has a cause.
2. The universe began to exist.
3. Therefore, the universe has a cause.

After attempting to justify the premises of this argument, Craig sets out to analyse what the cause must be like, given certain characteristics it must have. For example, he says the cause must be uncaused, timeless, spaceless, and immaterial (ibid., 152). Allegedly, the only kind of cause that could plausibly fit this description would be a powerful, immaterial mind – just as God is supposed to be.[2] In this article I examine Craig's case for premise (2). In particular, I focus on just one of the philosophical arguments he uses to establish that the universe began to exist – namely, that the metaphysical absurdity of an actually infinite number of things existing precludes the possibility of a beginningless past. Let's call this supporting argument *Hilbert's Hotel Argument* (HHA, for short). I begin by reviewing HHA, and follow by raising some initial doubts about the controversial first premise, which states that 'an actually infinite number of things cannot exist' (ibid., 116). After ultimately granting this premise for the sake of argument, I show that the second premise presupposes the falsity of a plausible metaphysical theory about time: presentism. Furthermore, Craig himself accepts presentism. It follows that, by his own lights, HHA should be rejected. Moreover, I show that elsewhere in Craig's defense of the *kalām* cosmological argument he presupposes the truth of presentism, which means that his defense of *kalām* is inconsistent. The remainder of the article critically evaluates possible responses on Craig's behalf. I conclude that Craig needs to abandon HHA.

Before we turn our attention to HHA, I should make one preliminary comment about the importance of HHA for Craig's defense of the *kalām* cosmological argument. In defending the claim that the universe began to exist, Craig appeals both to empirical evidence as well as to two general philosophical arguments, one of which is HHA. As I said, in this article I want to set aside the empirical evidence and consider the merits of HHA. It might seem that only empirical evidence from the fields of physics and

cosmology could hope to show that the universe began to exist, and that armchair philosophizing is of no use in this project. So, by setting this evidence aside and just focusing on a purely philosophical argument, one might get the impression that I am attacking the weakest part of Craig's case. However, I think this is a mistake. In the first place, Craig takes the philosophical arguments to be more important for his case than the actual empirical evidence.[3] Moreover, he is interested in showing that time itself – and, therefore, any physical world whatsoever – had an absolute beginning.[4] Yet it seems to me that this hypothesis is beyond the purview of the empirical sciences.[5] The important point for now is that, if I'm right, then Craig's case really rests heavily on his philosophical arguments for premise (2).

Initial worries for HHA

Let's now turn our focus to HHA. Craig states the argument as follows (ibid.):

(A1) An actually infinite number of things cannot exist.
(A2) A beginningless series of events in time entails an actually infinite number of things.
(A3) Therefore, a beginningless series of events in time cannot exist.

There's supposed to be a close connection between (A3) and premise (2) of the *kalām* cosmological argument. By establishing (A3), Craig thinks that he is thereby supporting (2).

Before we move on to evaluate Craig's reasons for accepting (A1) and (A2), it's worth noting that the wording of this argument sometimes varies. For example, elsewhere, Craig spells out the argument as follows (Craig (2001b), 221):

(A1*) An actual infinite cannot exist.
(A2*) A beginningless series of equal past intervals of time is an actual infinite.
(A3*) Therefore, a beginningless series of equal past intervals of time cannot exist.

Here there are three noticeable differences from the previous formulation of the argument. First, instead of claiming that an actually infinite number of *things* cannot exist, (A1*) just says that 'an actual infinite cannot exist'. Second, whereas Craig talks about 'events' in (A2), he instead talks about 'intervals of time' in (A2*). And third, (A2) says that a 'beginningless series . . . entails an actually infinite number of things", but (A2*) says that a 'beginningless series . . . is an actual infinite'. Despite these differences, I'll speak loosely about HHA, allowing that to name both of these arguments. I'll consider (A1)–(A3) the first formulation of HHA, and (A1*)–(A3*) the second formulation.[6] Our primary focus will be on the first formulation, but the second formulation will arise later in the discussion.

The justification for (A1) is based on certain thought-experiments which purport to show the absurdity of an actually infinite number of things existing. By 'actually infinite'

Craig means to be talking about 'a collection of definite and discrete members whose number is greater than any natural number 0, 1, 2, 3 . . .' (Craig (2008a), 116). This is contrasted with a 'potential infinite', which is 'a collection that is increasing toward infinity as a limit but never gets there' (ibid.).[7] So, according to Craig, if an actually infinite number of things existed, that would have some absurd implications for the kind of world we live in. For example, consider Craig's favorite thought-experiment on this topic: Hilbert's Hotel – a hotel with an actually infinite number of rooms. Now we're to suppose that a new customer comes to the hotel asking for a place to stay when every room is already occupied. In such a hotel, we merely need to shift everybody down a room (so the person in room 1 moves to room 2, and the person in room 2 moves to room 3, etc.). Now room 1 is available for the new customer. This means that, even though every room in the hotel is full, new guests can always be accommodated. Moreover, if an *actually infinite* number of new customers all request a room, the hotel can accommodate all of them. Each person who already has a room just needs to move to the room that's twice the number of his or her current room. So the person in room 1 moves to room 2, and the person in room 2 moves to room 4, etc. This empties out all of the odd-numbered rooms, and the infinity of new guests can be accommodated. This could be repeated without end. In a world with Hilbert's Hotel and an unlimited supply of new guests (and an unlimited supply of patience!), an infinite number of people can check into the already full hotel every thirty minutes.[8] This, Craig says, is absurd. Moreover, he claims that the thought-experiment can be made even more counterintuitive. Suppose somebody checks out of the hotel. Now we have an empty room, yet the hotel is still housing the same number of guests (because infinity minus one is infinity). In fact, suppose everybody in an odd-numbered room checks out. In this case, an infinite number of people have checked out, yet the same number of people remain in the hotel as before (i.e. infinity). And if we don't like having an infinite number of empty rooms in our hotel, we can simply shift the remaining guests around until all of the rooms are again occupied (ibid., 116–119).

Let's grant Craig (at least part of) what he wants us to take away from this thought-experiment: Hilbert's Hotel really is absurd, and it therefore cannot exist. Let's suppose for the sake of argument that such a place is not a real metaphysical possibility. Given that we've granted the absurdity of Hilbert's Hotel, does it follow that (A1) is true? It certainly follows that it's impossible for there to be a hotel with an actually infinite number of rooms. It might even generalize to the conclusion that it's impossible for there to be any building with an actually infinite number of rooms, or even more generally, that it's impossible for there to be any concrete object with an actually infinite number of equal spatial parts. Moreover, since Craig has elsewhere run the same kind of argument to show that there cannot be an actually infinite number of marbles, baseball cards, books, etc., let's suppose that the argument shows that there can't be an actually infinite number of physical objects. Better yet, let's grant that there cannot be an actually infinite number of concrete objects, physical or not.

Nevertheless, it is certainly not clear that (A1), 'an actually infinite number of things cannot exist', follows from the absurdity of Hilbert's Hotel, at least if abstract objects count as 'things'. Consider numbers, for example. If a number is a thing, and if there are

an actually infinite number of them, then (A1) is false. Of course, some philosophers have held that numbers are things, and that there are an actually infinite number of them. Let's call such a view about numbers 'Platonism'. In response to this worry, Craig reassures us that there are other views which hold that, for example, numbers don't really exist, or that there aren't an actually infinite number of them (ibid., 117). But surely this response misses the thrust of the worry. The obvious point to make is that *if* Platonism is correct, then it follows that the Hilbert's Hotel thought-experiment doesn't prove (A1). So it's Craig's burden to show that Platonism must be false. Rather than merely point out that we need not be Platonists, Craig needs to give an argument *against* Platonism. He may think that Hilbert's Hotel will suffice here, but I'm not at all inclined to agree. Should we conclude that just because it would be absurd for an actually infinite number of hotel rooms, marbles, baseball cards, or books to exist, that it would be equally absurd for an actually infinite number of *numbers* to exist? Or should we think that a suitably reformulated version of the thought-experiment – say, 'Hilbert's Platonic Heaven'[9] – would lead us to deny Platonism? If we're relying on intuitions alone here, it's unclear whether the intuitions will carry over. It may well be that our intuitions are better suited to tell us about concrete objects anyway.[10]

As it turns out, the general conclusion that Craig draws on the basis of the Hilbert's Hotel thought-experiment, (A1), rules out a number of other philosophical theories as well. In addition to Platonism about *numbers,* one might believe in an infinite number of other abstract objects – e.g. propositions, properties, sets, possible worlds, etc. Alvin Plantinga, for example, believes that possible worlds are abstract objects, and that there are an actually infinite number of them (Plantinga (1976), 144).[11] Likewise, (A1) entails that David Lewis's modal realism view of possible worlds is badly mistaken, since he believed in the existence of an infinite number of concrete worlds.[12] Moreover, some people have believed that space is continuous, made up of an infinite number of points, but (A1) seems to rule this out as well. Craig considers this possibility, but he imagines that his opponent must be trying to use this as a clear counterexample to (A1). His response is to point out that the notion that space is continuous is unproven (Craig & Sinclair (2009), 112). Seemingly, Craig thinks that it's up to his opponent to prove it. But again, Craig's premise seems to entail that space is not like this, which is also an unproven claim. True, if one could prove that continuous space is possible, then we'd have a counterexample to (A1). But since Craig is claiming that it's *not* possible, it's reasonable to expect him to prove it.

We're beginning to see that in order for HHA to go through, it has to settle a number of controversial metaphysical debates. And we're expected to think that these debates can be resolved by the Hilbert's Hotel thought-experiment, or parallel thought-experiments. It seems that there is plenty of room here to doubt that the absurdity of Hilbert's Hotel proves (A1).[13] Perhaps what it actually proves is something quite a bit more modest. Craig will undoubtedly point out that there are independent reasons to reject Platonism about abstract objects, David Lewis's modal realism, and the rest. But notice that there are really two distinct problems here. First, we can see that *if* any of these views is true, then Craig's premise is false. So Craig seems to have his work cut out for him in showing that all of these various views are false. But secondly, and

perhaps more importantly, I want to claim that whatever else can be said against these metaphysical views, we should probably not think that the Hilbert's Hotel thought-experiment disproves all of them. So even if Craig does have good reasons to reject these views, this would not show us that Hilbert's Hotel provides us with a good reason to reject these views, and therefore to affirm (A1). At the very least, we should probably be hesitant to accept (A1) on the basis of Hilbert's Hotel, given that it rules out a number of plausible metaphysical views that have been held by some very intelligent people.

At this point I'm not quite sure what the full import of Hilbert's Hotel actually is. But having registered some of my worries, let's suppose Craig is right to think that the thought-experiment actually shows that (A1) is true. I'm certainly dubious about whether we can really make such a determination on the basis of the intuitions we get about the hotel, but I want to be as charitable to Craig here as I reasonably can be in order to see where the argument goes from there.

When it comes to defending (A2), Craig usually doesn't have as much to say. In addition to claiming that it's 'obvious', he writes: 'If the universe never began to exist, then prior to the present event there have existed an actually infinite number of previous events. Thus, a beginningless series of events in time entails an actually infinite number of things, namely, events' (Craig (2008a), 120).

Craig doesn't go into great detail explaining exactly what he means by an 'event', but it's apparently supposed to be an existing *thing*. It's notable, however, that in another context Craig seems to acknowledge a chasm between events, on the one hand, and things, on the other:

> Normally, we speak of something's becoming this or that; but temporal becoming is conceived to be absolute. 'In the pure becoming of an event,' demands Smart, 'what does the event become?' . . . Smart's question is strangely misconceived, however, for he himself has repeatedly emphasized Broad's point that it is *things,* not *events,* that come to be; an event is just the coming to be of some thing or things. (Craig (2001b), 156)

If being a *thing* and being an *event* are different in this way, it's unclear how HHA is supposed to get off the ground in the first place. (A1) tells us that there can't be an actually infinite number of things, and (A2) tells us that a beginningless past would entail an actually infinite number of events (read: *events,* not *things*). Craig would need some additional premise to make the argument go through. For example, he would need:

> (IE) An actually infinite number of events cannot exist.

Then, of course, we would like to know what kind of justification there could be for (IE). Hilbert's Hotel wouldn't work here, because it says nothing at all about events.

It's also worth pointing out that some philosophers have denied that events exist. Terence Horgan, for example, argues that 'it is a mistake to posit events at all' on the grounds that, 'despite the initial appearances, there is no real theoretical need to posit

events. So, since their elimination yields an important simplification of ontology, we should banish them from existence' (Horgan (1978), 28). Similarly, Peter van Inwagen writes: 'There are, I would say, no events. That is to say, all statements that appear to involve quantification over events can be paraphrased as statements that involve quantification over objects, properties, and times – and the paraphrase leaves nothing out' (van Inwagen (2011), 220). Craig himself agrees that such a position is plausible, though it's not clear to me whether he is willing to endorse it. In (Craig (2011b), 220), immediately after claiming that events are among 'the sorts of thing that many metaphysicians plausibly deny exist', Craig states: 'These things are real in the sense that they are not illusory, but they are not, properly speaking, existents.' As it happens, this concession causes problems for HHA, as will soon become apparent.

Elsewhere, as already noted, Craig substitutes 'intervals of time' into the argument in place of 'events'. It's certainly questionable whether an interval of time is a 'thing' in the required sense. Things, at least of the non-eternal sort, ordinarily come into and pass out of existence; intervals of time merely pass.[14] On the face of it, at least, it seems we're talking about different categories altogether when we use examples about hotel rooms and other physical objects and then apply that reasoning to intervals of time. So I'm inclined to think that someone who accepts the premise that an actually infinite number of *things* cannot exist has some leeway in which he or she might deny that an event or interval of time is the kind of 'thing' to which the argument applies.

Craig has claimed that 'event' just means 'any change' (Craig & Sinclair (2009), 106). And presumably, a change involves a *thing* losing or gaining one or more properties. Here again some of the same worries as before begin to crop up. Is a *change* supposed to be a *thing* in the way that a physical object is a thing? If a change is just something that happens to a thing, and is not itself a thing, then for all I know there could be a possible world with a finite number of things (i.e. objects) which nevertheless change an infinite number of times. Perhaps there's a world that just consists of a sphere that has been changing colors – say, alternating between being red and being green – from eternity, and will continue to do so forever. How many things *exist* at that world? Maybe just three: the sphere, redness, and greenness.[15] Here's an alternative answer that, I suspect, most of us would find counterintuitive: an infinite number of things exist at that world, since in addition to the sphere and the properties of redness and greenness, you have to count the infinite number of color changes as existing things. If HHA convinces Craig that there cannot be a world like the one envisioned, then it seems he would endorse this counterintuitive answer to our question. Otherwise, it's unclear why Hilbert's Hotel would allow us to conclude that there can't be an infinite number of changes.[16]

Let's nevertheless set that worry aside and assume that an event, whatever it is, is a thing which exists – the kind of thing that Hilbert's Hotel shows us to be limited in number. Craig seems to want to say that to deny (2) is to suppose that an actually infinite number of past events (or intervals of time, or changes) compose the past. But given that we have seen that an actually infinite number of things cannot exist, we must deny that there can be an actually infinite number of past events. And to deny that is just to affirm (2).

It's important to pause here and consider exactly how HHA is supposed to work. We've already accepted (for the sake of argument, at least) that an actually infinite number of things cannot exist. Craig thinks that anybody who denies this will be forced to accept an undesirable view. In his words: 'It is indisputable that if an actually infinite number of things were to exist, then we should find ourselves landed in an Alice-in-Wonderland world populated with oddities like Hilbert's Hotel' (Craig (2008a), 119–120). So it looks like the argument is supposed to be construed in basically the following way: we know that an actually infinite number of things cannot exist, so we should reject any view that entails that an actually infinite number of things exist. But, as it happens, somebody who believes that the universe is past-eternal is committed to saying that an actually infinite number of things (namely, events) exist. Since this conflicts with what we know to be the case (on the basis of Hilbert's Hotel), we should reject that view.[17] One way of formalizing the argument would go like this:

(M) It's metaphysically impossible for an actually infinite number of things to exist.
(B) The universe began to exist.
  (B1) If ~ (B), then ~ (M)
  (B2) (M)
  (B3) Therefore, (B)

Note that (M) simply paraphrases premise (A1), and (B) is identical to premise (2) of the *kalām* cosmological argument. Now, when Craig defends HHA in order to prove premise (2), I think what he's after is something like (B1)–(B3). Since the conclusion of this argument is just (B), and since that's precisely the same as (2), this way of formulating the argument at least has the virtue of making it clear how it's supposed to support (2). Notice that on Craig's rendering of HHA, it's not immediately clear what the connection is between (A3) and (2). Finally, keep in mind that Craig's reason for accepting (B1) is that the falsity of (B) entails that an actually infinite number of past events exist.

Problems from the metaphysics of time

It seems to me that, in making this argument, Craig is presupposing a certain view about the metaphysics of time. As such, it would be good here to distinguish briefly two competing theories in the current debate: the A-theory and the B-theory. On the A-theory of time, which is often referred to as the *tensed* or *dynamic theory,* there is a real, objective difference between past, present, and future. Generally, according to this view, the present has a privileged ontological status. In fact, some philosophers have thought that the A-theory is committed to a doctrine called 'presentism'. On that view, only the present is real. In Craig's own words, presentism is

> the doctrine that the only temporal entities that exist are present entities. According to presentism, past and future entities do not exist. Thus, there really are no past

> or future events, except in the sense that there have been certain events and there will be certain others; the only real events are present events. (Craig (2001b), 148)

Craig also seems to believe that A-theorists are committed to presentism. For example, in one place he apparently conflates the two views, writing: 'According to the A-theory, things/events in time are not all equally real: the future does not yet exist and the past no longer exists; only things which are present are real' (Craig (2008a), 121).

Elsewhere, in a discussion of McTaggart's Paradox, he approvingly notes that other thinkers have concluded that the A-theory is committed to presentism:

> Sharp-sighted critics of McTaggart such as C. D. Broad and A. N. Prior have insisted almost from the beginning that a dynamic or tensed theory of time implies a commitment to presentism, the doctrine that the only temporal entities that exist are present entities. (Craig (2001b), 148)

Indeed, Craig believes that by accepting presentism, the proponent of the A-theory can avoid McTaggart's Paradox, which would otherwise be a good argument against the A-theory. Thus, regarding certain versions of the A-theory which reject presentism, such as the so-called 'growing block theory' and the 'moving spotlight theory', Craig says that it's 'doubtful . . . whether these hybrid theories are coherent' (Craig (2008b), 597–598). In Craig's view, then, presentism is simply the only viable version of the A-theory.

The B-theory, by contrast, is often referred to as the *tenseless* or *static theory* of time. On this view, no point in time is ontologically privileged. As Craig puts it: 'all events in time are equally real' according to the B-theory (Craig (2008a), 121). Therefore, the distinction between past, present, and future does not designate anything of ontological significance; past events are just as real as present events. Compared to Napoleon, William the Conqueror is in the *past.* But compared to Julius Caesar, William the Conqueror is in the *future.* There is no objective fact about whether something or somebody exists in the past, present, or future, because those characterizations are merely relative to times. B-theorists usually talk about a different set of temporal relations: *earlier than, simultaneous with,* and *later than.*

Now, suppose I deny that the universe had a beginning. Craig would then say that I'm committed to the existence of an actually infinite number of things – namely, the infinite number of past events. If Craig is right, then I either have to give up my belief that the universe never began to exist, or else I have to give up my earlier concession that an actually infinite number of things cannot exist. But suppose I'm a presentist. As Craig himself characterized the view in the quoted passage above, a presentist doesn't believe that past events exist. So a presentist who denies that the universe began to exist is *not* thereby committed to the existence of an actually infinite number of past events. As a presentist, I would simply respond to Craig by reminding him that, in my view, past events don't exist at all – so there's no way I'm committed to an *infinite* number of them existing. Thus, the absurdity Craig was aiming for with his argument does not result if we accept presentism. Recall that the absurdity was supposed to result for

anyone who believes, contrary to (A1), that *the number of things that exist* is actually infinite.[18]

Perhaps, then, the Hilbert's Hotel argument could be geared towards proponents of a B-theory of time, since that view would maintain that past events really exist. But at the very least, the A-theorist should be off the hook here. If Craig is correct that the A-theory entails a commitment to presentism, and if a presentist can easily reject HHA on the grounds that premise (A2) presupposes the falsity of presentism, it follows that the argument is ineffective against a proponent of the A-theory. One might well conclude that Craig is presupposing the B-theory in his defense of HHA.

This might not appear too problematic if Craig were to go on to defend the truth of the B-theory. The problem, however, is that he is a committed A-theorist and presentist (Craig (2001b), 115–216). This means that, by his own lights, the argument should not be accepted. Furthermore, aside from HHA, Craig uses a second, independent philosophical argument for premise (2) of the *kalām* cosmological argument, and he is explicitly clear in his writings that this other argument depends upon the truth of the A-theory. Writing about one of the premises of this argument, he says: 'As obvious as this premise may seem at first blush, it is, in fact, a matter of great controversy. It presupposes once again an A-theory of time' (Craig & Sinclair (2009), 124). Moreover, the *kalām* cosmological argument as a whole depends upon the truth of the A-theory, according to Craig:

> From start to finish, the *kalam* cosmological argument is predicated upon the A-theory of time. On a B-theory of time, the universe does not in fact come into being or become actual at the Big Bang; it just exists tenselessly as a four-dimensional space-time block that is finitely extended in the earlier than direction. If time is tenseless, then the universe never really comes into being, and, therefore, the quest for a cause of its coming into being is misconceived. (ibid., 183–184)

In short, then, in defending these arguments Craig is presupposing inconsistent metaphysical views. When he defends the first philosophical argument in support of (2), HHA, he seems to presuppose the B-theory, and when he defends the second philosophical argument in support of (2) he presupposes the A-theory. And since the *kalām* argument as a whole requires the A-theory, Craig's defense of HHA falls flat.

Craig's response

My main contention in the previous section was that Craig's use of Hilbert's Hotel is ineffective against proponents of the A-theory of time, as long as the only viable version of the A-theory is presentism. This is because a presentist who claims that the universe is past-eternal is *not* committed to the existence of an actually infinite number of events. Past events, on that view, don't exist at all.

In a recent defense of the *kalām* cosmological argument co-authored by Craig and James Sinclair, the authors responded to a related worry. According to them, both

Aristotle and Thomas Aquinas accepted (i) the presentist view that past events don't actually exist, and therefore (ii) the notion that 'the series of past events [is] a potential infinite' rather than an actual infinite (Craig & Sinclair (2009), 115). Note that these are two separate contentions. I have been arguing that (i), all by itself, is sufficient to cause major problems for HHA.

In responding to Aristotle and Aquinas, it seems to me that Craig and Sinclair unfortunately latch onto (ii) and utterly neglect (i). They write: 'The question, then, is whether events' temporal distribution over the past on a presentist ontology precludes our saying that the number of events in a beginningless series of events is actually infinite' (ibid.). Surely this is *a* question. But I'm not convinced it's *the* question. One could agree with Craig and Sinclair that, even on a presentist ontology, if the universe didn't begin to exist, then there have been an infinite number of events. But this does nothing to ease the worry raised by (i), which I take to be the more important problem here. Even though, in such a scenario, the number of events that *have occurred* is actually infinite, the fact remains that on a presentist ontology none of those events exists.[19] Recall that the entire argument was predicated on the notion that an actually infinite number of things cannot *exist*.

Wes Morriston has made the point that the absurdity of Hilbert's Hotel results from the fact that every member of an infinite set exists at once, and is able to be moved about in relation to one another (Morriston (2003), 296). As we have seen, the doctrine of presentism presents a problem for Craig if he wants to use the thought-experiment to argue that the number of past events must be finite. But there's another problem lurking here as well. Morriston has pointed out that past events cannot be shuffled around in the way that hotel guests can, which vitiates Craig's attempted use of the thought-experiment (ibid., 296–297). Craig's response to this point is worth considering. He insists that in order to see the absurdity you don't need to be able to manipulate the objects in that fashion. He says:

> Let's suppose Hilbert's Hotel is a hotel where, say, all the rooms are locked, so that people can't move out of them. Or maybe there are no doors to the rooms, so that you have an infinite number of rooms, one person in each room, but there are no doors . . . You can still *imagine* what it would be like for [the] person in room one to be in room two, and for the person to room two – he could be in room four. And you'll generate the same absurdities. You don't have to actually go through the trouble of *moving* the people physically. (Craig (2009))

This response is surely strange, given what Craig has written elsewhere. Consider a separate worry for the Hilbert's Hotel argument that goes something like this: mathematicians know full well that you can't subtract infinities, yet the illustration supposes we 'subtract' an infinite number of guests as they check out from the hotel. On this point, Craig writes: 'In trans-finite arithmetic, inverse operations of subtraction and division are prohibited because they lead to contradictions; but in reality, one cannot stop people from checking out of the hotel if they so desire!' (Craig (2008a), 120). Yet, notice that this is precisely what Craig is now doing in response

to Morriston's objection – namely, imagining the thought-experiment in such a way that the people *are* prevented from being able to check out of the hotel. If the thought-experiment is described so that the guests are free to switch rooms and check out of the hotel, then it isn't analogous to past events, which can't be moved around in relation to one another. And if the thought-experiment is redescribed, in the way Craig imagines, to make it more analogous to past events, then it comes with a cost: Craig can no longer claim that the hotel guests are free to check out in response to the objection that you can't subtract infinities. Craig thereby sacrifices his response to one objection in his attempt to respond to another objection.

Let's set this problem aside and refocus our attention on the problem that presentism poses for Craig. One way for Craig to respond to this objection, suggested by his response to the previous objection, is to claim that it doesn't matter whether or not the past events exist, as long as they can be numbered. Indeed, he claims that since past events can be counted, we can simply run a Hilbert's Hotel-style thought-experiment using an infinite number of past events rather than an infinite number of hotel rooms. The way to carry out this sort of procedure is, first, to number the events mentally, starting with the present and working our way back. Then, we simply note the same sorts of absurdities that attended the original thought-experiment. In Craig's words, if the past is eternal,

> then there have occurred as many odd-numbered events as events. If we mentally take away all the odd-numbered events, there are still an infinite number of events left over; but if we take away all of the events greater than three, there are only four events left, even though in both cases we took away the same number of events. (Craig & Sinclair (2009), 116)

But all of this is supposed to be metaphysically absurd, just like Hilbert's Hotel. And it's supposed to give us reason to reject the view that there are an actually infinite number of past events.

This response won't work for a couple of reasons. First, if we accept this line of argument it looks like we'll have to accept a parallel argument that shows that the universe cannot be future-eternal.[20] We can mentally number future events and do the same operations to *them*. So if Craig's argument shows that time must have a beginning, then a parallel argument shows that time must come to an end. But this is unacceptable. Surely the argument doesn't *really* prove such a thing as that! Craig might want to claim that we can't count events that haven't yet occurred, whereas we can count events that have occurred. This is false. If we construe events as 'equal intervals of time', then we can surely mentally number and count future events just as easily as we can past events. Or consider Morriston's proposal that God decrees that two angels take turns praising him for a minute at a time for eternity (Morriston (2010), 443). I suggest it would not be too difficult to number these events mentally and then mentally shuffle things around in the way Craig is doing for past events.

Craig's preferred response here is to argue that although time will never come to an end, the series of future events is nevertheless only potentially infinite, not actually

infinite (Craig (2010b)). Thus, our Hilbert's Hotel-style reasoning would not apply to the future. This is a mistake. If the angels will be taking turns praising God forever, then the number of future praises must be the same as the number of past praises given the assumption that they *have been* taking turns praising God for an eternity. Craig insists that the number in the latter case is actually infinite. But if that's right, then he cannot deny that the number in the former case is actually infinite as well, since the past praises and the future praises can be put in a one-to-one correspondence. Craig's insistence that the future praises are not *real* is irrelevant, since past events aren't real either on the presentist view. Nevertheless, as Craig himself points out, we can still mentally number them and generate (alleged) absurdities. But since nobody thinks this argument seriously shows that time must come to an end, we shouldn't think it shows that time must have had a beginning, either.

The second reason this line of response won't work to Craig's advantage is that it's not clear whether the revised thought-experiment results in a metaphysical absurdity like Hilbert's Hotel. Hilbert's Hotel was absurd because of the counterintuitive implications that resulted from having an actually infinite number of things existing all at once. To claim that the same absurdity can be generated with an actually infinite number of non-existing things like past events makes it seem like Craig's complaint is with the mathematical legitimacy of infinity, not just the idea that the actual infinite is instantiated in reality. It's true that the number of past events is the same as the number of even past events, in Craig's scenario, and this is a straightforward implication of saying that the number of past events is actually infinite. But what is *metaphysically* absurd about this, if the events don't exist? It still remains that the only conclusion we're able to draw from the absurdities that are generated from mentally numbering and then mentally shuffling past events is this: an infinite number of past events cannot exist. And as we've seen, the presentist is already on board with *that,* regardless of whether or not she thinks that an infinite number of them have occurred.[21]

Because HHA has been variously formulated, Craig might concede that a presentist would be unaffected by the contention that an actually infinite number of things cannot exist. Instead, he might say, we should examine the second formulation of HHA:

(A1*) An actual infinite cannot exist.
(A2*) A beginningless series of equal past intervals of time is an actual infinite.
(A3*) Therefore, a beginningless series of equal past intervals of time cannot exist.

Although the presentist escapes the original argument by avoiding a commitment to an infinite number of things existing, this alternative formulation doesn't explicitly say anything about an infinite number of things existing, but instead talks about the existence of actual infinites themselves.

To assess this response, we need to ask what premises (A1*) and (A2*) are supposed to mean, and whether adequate support has been provided for them. First, we'd want to know what it means to say that 'an actual infinite cannot exist'. The most natural interpretation of this claim seems to be that an actually infinite *number of things* cannot exist. Yet we've already seen the problem that accompanies this formulation of the

premise, since it allows presentists (Craig included) off the hook. We want to find a reading of this premise which doesn't have this defect. So what can it mean to say that 'an actual infinite cannot exist' which does not reduce to 'an actually infinite number of things cannot exist'? If we speak of things this way, then it apparently must be the case that, if an actual infinite *could* exist, then it could exist even when the number of existing things is finite.[22] One way of helping us get a grip on this is to ask what way of formulating the argument will allow Craig to get what he wants – namely, the conclusion that there cannot have been an actually infinite number of events prior to now. Here's a first approximation of the principle he needs:

(M*) It is metaphysically impossible for there to be a time before which an actually infinite number of things have existed.

With that in mind, we can see that (M*) would help Craig's argument go through. But what reason has he given (or could he give) in support of this principle? Recall that Hilbert's Hotel was an illustration in which an actually infinite number of rooms existed all at once. At best, that could justify (M) from earlier, but it leaves open the possibility that (M*) is false. What we'd need is some other illustration which shows that an actually infinite number of things cannot even compose a series in which almost all of the things no longer exist.

One possibility is briefly mentioned by Craig and Sinclair, in their article from *The Blackwell Companion to Natural Theology:*

> Aquinas' own example of a blacksmith working from eternity who uses one hammer after another as each one breaks furnishes a good example of an actual infinite, for the collection of all the hammers employed by the smith is an actual infinite. The fact that the broken hammers still exist is incidental to the story; even if they had all been destroyed after being broken, the number of hammers broken by the smith is the same. (Craig & Sinclair (2009), 116)

While I again agree with Craig that the number of hammer-breaking events in such a scenario is actually infinite,[23] it's not clear to me whether such a scenario is really impossible. If the blacksmith has been making a new hammer out of new materials each time his old hammer breaks, then presumably the world would be populated with an actually infinite number of broken hammer pieces. *This* can be ruled out by the use of a 'Hilbert's Hammer Collection' thought-experiment, as I granted earlier in the article. But if the blacksmith has been merely fixing the same hammer every time it breaks, then I'm not yet convinced that the scenario is impossible. Something more must be said to motivate the intuition that the eternal blacksmith scenario is absurd (i.e. metaphysically impossible). While I of course find the scenario hard to fathom, it's no more difficult to imagine than any other past-eternal scenario. And, in any case, it's hard for me to fathom *either* a world without beginning *or* a world with an absolute beginning. So I'll leave it to Craig to offer up some other thought-experiment to justify (M*).

Yet another avenue is open to Craig to respond to our hypothetical presentist. Craig might claim that, since the argument would obviously work to show that the past is finite given the B-theory of time (in which all events are equally real), it's plausible to think that it must work for the A-theorist as well (ibid., 115). After all, how could one's metaphysical theory of time make a difference to whether past events are finite or infinite in number? It would be strange indeed if one's acceptance of the B-theory forced her to conclude that the universe had a beginning, whereas her acceptance of the A-theory would have kept open the possibility of a past-eternal universe. We can formulate this line of argument as follows:

(C1) If HHA is sound given the B-theory, then it's sound given the A-theory.
(C2) HHA is sound given the B-theory.
(C3) Therefore, HHA is sound given the A-theory.

And here I think there's at least some plausibility to premise (C1). But one person's *modus ponens* is, of course, another person's *modus tollens*. I think the following argument is more compelling:

(C1) If HHA is sound given the B-theory, then it's sound given the A-theory.
~ (C3) HHA is not sound given the A-theory.
~ (C2) Therefore, HHA is not sound given the B-theory.

It seems to me that we have at least as much reason to accept ~ (C3) as we have to accept (C2). I've shown, taking words straight from Craig's own writings, that there is a clear inconsistency in what he says about the A-theory and presentism on the one hand and HHA on the other.

On a similar note, one can see in Craig's more recent writings that he tries dealing with the problem we've raised by noting that, on a 'growing block' theory of time, the objection can't even get off the ground, since that view posits that past events do exist (ibid. and Craig (2010b), 456). And he's right about that. The primary objection I've been pressing in this article wouldn't have got any traction if we were evaluating how a growing block theorist could reply to HHA. But I don't see how this helps Craig's case, since *he* is a presentist, not a growing block theorist. If I agree with Craig that presentism really is the only coherent version of the A-theory, then I've got to examine how the argument fares against my own position. Craig's argument should not sway the presentist, even if it *should* sway the growing block theorist. Craig could, I suppose, renounce presentism and start endorsing a view that he's previously said was incoherent. Otherwise, I can't see how the growing block theory is going to offer any comfort to Craig, who remains a presentist.

Lastly, Craig has recently offered one other response that might apply to the presentist's objection. He claims that on a presentist ontology, past events still have some sort of ontological status not shared by future events. He writes:

> Everything that has happened has been actualized. As the medievals put it, these events have exited from their causes and are therefore no longer in potentiality.

> The actual world thus includes both what does exist and what did exist. But events which have yet to take place, being pure potentialities, are, on a tensed view of time, not part of the actual world . . . Even if past events do not exist, they are still part of the actual world in a way that future events are not, since the actual world comprises everything that has happened. (Craig (2010b), 456)

In context, Craig is here arguing against Morriston's claim that HHA commits Craig to the view that the future must be finite. Craig is trying to show that there is a relevant difference between the past and the future which allows the argument against the infinite past to go through but which does not similarly apply to the future. The strategy is to say that, although neither past nor future events exist, past events are part of the actual world, whereas future events are not. Might this strategy help Craig overcome the problem that HHA is unsound given the truth of presentism? After all, if Craig is right, then the presentist who believes that the universe is past-eternal is positing a world in which, so to speak, an infinite number of things have appeared on the radar – that is, an infinite number of things belong to that world in *some* sense.

It's not clear to me why this should be a problem – i.e. why I should be motivated to reject the notion that the actual world is something to which an actually infinite number of past events *belong,* in some sense. The past events aren't *real,* according to the presentist; they don't *exist.*[24] By positing such a world as this, we are not thereby embracing the (allegedly) absurd conclusion that an actually infinite number of things exist, as was the case with Hilbert's Hotel. So I don't know what the problem is supposed to be. Whatever else can be said against this line of response on Craig's behalf, HHA would need to be reformulated if he wants to use this ontology to overcome our objection. Here's a rough sketch of how Craig could reformulate HHA:

(D1) There cannot be a world in which an actually infinite number of things have been actualized.
(D2) If the actual world is one in which the universe is past-eternal, then there is a world in which an actually infinite number of things have been actualized.
(D3) Therefore, the actual world cannot be one in which the universe is past-eternal.

While this argument might be worth investigating, I'm not convinced that Hilbert's Hotel applies to the relevant premise (D1). I'll leave it to Craig to prove otherwise.[25]

Conclusion

Craig's philosophical arguments for a finite past are crucial for the success of the *kalām* cosmological argument. In this article we've looked at one of two such arguments Craig has defended. We've found that the argument is powerless against proponents of presentism. And if Craig is correct to equate the A-theory with presentism, then

the argument is ineffective against the A-theorist. Since Craig's other argument for premise (2), as well as the *kalām* cosmological argument in general, depends upon the truth of the A-theory, it turns out that these arguments are in tension with one another. The possible lines of response that we've looked at are not sufficient to overcome the force of the objection.[26]

Notes

1 The specific wording of this argument tends to vary slightly depending on the publication.

2 Abstract objects, Craig reminds us, cannot stand in causal relations.

3 Craig (2011a) has stated:

> The primary argument[s] that I give for the finitude of the past are philosophical arguments – based on the impossibility of the existence of an actually infinite number of things, and then secondly on the impossibility of *forming* an actual infinite by successive addition. So I see the scientific evidence as merely confirmatory of a conclusion that has already been reached on the basis of philosophical arguments.

4 We need to keep this fact firmly in mind. Craig cannot determine that the cause was timeless unless he shows that time had a beginning, and that the beginning of time had a cause. Throughout this article, when I speak of the hypothesis that the universe is past-eternal, that can be read as the hypothesis that time is past-eternal.

5 Although I cannot defend that thesis here, a good basic sketch of some of the reasons that convince me can be found in (Morriston (2003), 288-289). Craig has similarly stated that time could have preceded the existence of the universe, which makes me wonder how strong he thinks the empirical evidence can possibly be for establishing that time had an absolute beginning (Craig (2011a)).

6 Moreover, there's yet another formulation of the argument to be found in a more recent publication. See (Craig & Sinclair (2009), 103), where the second premise in the argument is stated: 'An infinite temporal regress of events is an actual infinite.' It's not entirely clear to me what (if anything) hangs on the different formulations of these premises, or why Craig has been motivated to state the argument in so many different ways.

7 Craig is thinking of a divergent sequence which tends to infinity. A potential infinite is a collection that is increasing such that the number of its members will eventually be larger than K, for any real number K.

8 I'm ignoring the fact that such actions as moving into and out of a room would take time, especially when one must travel extremely long distances (light years?) to reach the room that's twice the number of one's current room, once the room number is sufficiently high. Perhaps God could shuffle the guests about instantaneously, so that this would not be a worry. In any case, I won't worry about it here.

9 Craig is welcome to explain how such a thought experiment would work, if he cares to go this route. Here's a possibility: imagine a realm with an actually infinite number of numbers. Now suppose a new number comes along wanting to be added to the collection. In this case, we simply need to shift all of the other numbers around in

such-and-such a way, and as a result we will have accommodated the new number. Or suppose a number decides to leave this Platonic Heaven. Nevertheless, the same number of numbers remains as before. I confess that this thought experiment doesn't make any sense to me, and it gives me no intuitions about whether there can be a Platonic Heaven.

10 We should keep in mind that every argument in favour of Platonism (at least those versions which include an infinite number of abstract objects) counts against (A1). Craig seems to think the burden of proof here is on his opponents to prove Platonism and rebut all of the alternatives (Craig (2008a), 107-108).

11 I'm not sure whether Plantinga explicitly commits himself to saying that the number of worlds is actually infinite in any of his publications, but he confirmed this via email on 28 June 2012.

12 For Lewis's view of possible worlds, see Lewis (1986). On the number of worlds, see Lewis (1973), 90n. Of course, I have granted for the sake of argument that there cannot be an actually infinite number of concrete objects, which would rule out Lewis's view.

13 A good discussion of these issues, and more, can be found in Morriston (2002).

14 Surely it would be strange to talk about an hour or a minute coming into existence and passing out of existence. When would an hour come into existence? When would it cease to exist? An hour later? Would we want to say that the nine o' clock hour comes into existence at 9.00, and passes out of existence at 10.00?

15 Thanks to Christopher Gibilisco for suggesting this example.

16 Thanks to David Chavez for some helpful discussion regarding this difficulty for Craig's argument.

17 This is how Craig presents the argument, at least. I should note that he need not claim something so strong. He could try to argue merely that a past-eternal universe would entail that it's *metaphysically possible* that an actually infinite number of things exist. (Thanks to Wes Morriston for bringing this possibility to my attention.) I have my doubts about such an argument, but perhaps it will end up being better than HHA.

18 At this point, I should remind the reader that some metaphysicians deny that events exist – and plausibly so, according to Craig (2011b, 220). But if we believe that events don't exist, what should we make of Craig's claim that proponents of a past-eternal universe are committed to the existence of an actually infinite number of past events?

19 It's been suggested by Richard Field that, given presentism, Aristotle and Aquinas were correct to deny that the past was an actual infinite. As Field (an apparent presentist) puts the point: 'The past is not actual.' I suspect that this may be a purely semantic dispute between Field and Craig. For Craig, I take it, the past events don't have to exist in order to be correctly described as an 'actual infinite' in the sense that he *means* to use that term. Nevertheless, I admit that it is puzzling to think of non-existing things (past events) forming a 'collection', which is what Craig has to do in order to consider the series of past events as an 'actual infinite', by his definition of that term. Craig must be taking non-existing things to be definite and discrete members of a collection, and it seems to me that Field is right to question whether that is coherent. Is there a collection of unicorns, even though unicorns do not exist? Or would Craig say that the dinosaurs that once lived on this planet form a collection? Does the collection now exist even

though the dinosaurs don't? I admit that I'm puzzled by all this, and I think Craig owes us an explanation for why we should think of past events as forming a collection given presentism. We could perhaps raise the worry by imagining a presentist's reply to Craig:

> I think the universe is past-eternal, but it's not clear to me why you think I'm committed to the notion that there *exists* a collection of past events with an infinite number of definite and discrete members. In what sense am I committed to believing that such a collection exists, given that I don't think any of the members of that alleged 'collection' exist?

For Field's take on the present argument, which is very much in line with my own (and to which I owe a great debt of gratitude), along with Craig's response to Field, see Craig (2010a).

20 Thanks to Wes Morriston for making this point in commenting on an earlier draft of this article.

21 In conversation, Craig has responded by insisting that an actually infinite number of things can neither exist *nor have existed.* Here, I think, we should question whether Craig has given any convincing reason to believe this new claim.

22 Imagine the presentist again, who claims that an actually infinite number of things cannot exist, yet that there has been an actually infinite number of past events (which no longer exist). Craig needs to rule out such a view. So the series of past events, none of which exists, is said to compose an actual infinite, and the series is therefore rejected as metaphysically impossible. The point is that the series must be taken to be something over and above its members, since the series 'exists' on the hypothetical presentist's view, but the members of the series don't.

23 By this I just mean to say that there has been an infinite number of such events, not that past events are 'actual' in any sort of metaphysical sense. See my comments in note 19.

24 It's worth mentioning, though, that, in his debates at least, Craig has fallen into the habit of speaking of past events as 'real', despite what he says in his writings (e.g. the passage characterizing presentism, quoted earlier). See his opening statement in his 2011 debate with Stephen Law, or his opening statement from his 2011 debate with Peter Millican.

25 I should mention one last line of argument on Craig's behalf, which was originally brought to my attention by William Demsar. A presentist might be inclined to say that we need presently existing 'tensed facts' to serve as truth-makers for past-tensed propositions. If this is so, then if the universe is past-eternal, there would presumably be an actually infinite number of such facts. Isn't such an outcome absurd? Since I don't have the space here to assess this argument fully, I'll simply respond by noting four things. First, the account of truth-makers would need to be filled out in order to see whether this is a problem that only arises if the universe is past-eternal. After all, if there would still be an actually infinite number of such facts even on the supposition that the universe began to exist a finite time ago, then this line of argument would prove too much! Second, if there are truths about the future, and if each of these truths requires a presently existing truth-maker, then this argument would seem to entail that the future cannot be infinite. Third, speaking for myself, it doesn't seem intuitively absurd to me that there could be an infinite number of facts. If facts count as things,

then we should go back and question our earlier concession that an actually infinite number of things cannot exist. Fourth, Craig himself does not accept the sort of truth-maker account that Demsar has in mind (Craig (personal communication) and Craig (2001a)). Presentists like Craig sometimes deny that truths about the past and future require truth-makers.

26 A very early version of this article was presented as a paper at a philosophy graduate student colloquium at the University of Nebraska-Lincoln. A later version was presented at the 2012 Midwest Evangelical Philosophical Society meeting. I'd like to thank everyone who attended those talks and discussed the paper with me during Q&A. The article has benefited from the helpful comments and advice of numerous individuals: Patrick Arnold, William Demsar, Luke Elwonger, Richard Field, Greg Janzen, Robin Le Poidevin, Chris Tweedt, and an anonymous referee for *Religious Studies*. Especially helpful were extensive comments on earlier drafts provided by Christopher Gibilisco, Wes Morriston, Adam Thompson, and Preston Werner. Lastly, I must thank David Chavez for suggesting the title.

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10

No Heartbreak at Hilbert's Hotel: A Reply to Landon Hedrick

Andrew Loke

In his article, 'Heartbreak at Hilbert's Hotel', Landon Hedrick argues that the 'Hilbert's Hotel Argument' (HHA) is ineffective against proponents of presentism (Hedrick (2013)). Hedrick explains that HHA is one of the philosophical arguments William Lane Craig uses to establish that the universe began to exist, which is a premise of the *kalām* cosmological argument for the existence of God. According to Hedrick, HHA is stated by Craig as follows:

(A1) An actually infinite number of things cannot exist.
(A2) A beginningless series of events in time entails an actually infinite number of things.
(A3) Therefore, a beginningless series of events in time cannot exist.

Hedrick goes on to discuss HHA, explaining, among other things, Craig's own presentist views and then argues

> One could agree with Craig and Sinclair that, even on a presentist ontology, if the universe didn't begin to exist, then there have been an infinite number of events. But this does nothing to ease the worry . . . Even though, in such a scenario, the number of events that have occurred is actually infinite, the fact remains that on a presentist ontology none of those events exists. Recall that the entire argument was predicated on the notion that an actually infinite number of things cannot exists. (ibid., 11)

Hedrick considers and rejects possible replies on Craig's behalf. One of the possible replies is a rough sketch of how Craig could reformulate HHA, as follows:

(D1) There cannot be a world in which an actually infinite number of things has been actualized.
(D2) If the actual world is one in which the universe is past-eternal, then there is a world in which an actually infinite number of things has been actualized.
(D2) Therefore, the actual world cannot be one in which the universe is past-eternal. (ibid., 16–17)

After stating this argument, Hedrick writes: 'While this argument might be worth investigating, I'm not convinced that Hilbert's Hotel applies to the relevant premise (D1). I'll leave it to Craig to prove otherwise' (ibid.).

In this reply to Hedrick, I shall show that it is very easy to modify HHA such that it applies to the relevant premise (D1). I shall then address a number of other relevant concerns Hedrick raises in the article.

Modified HHA

This is how a modified HHA would go. Suppose this is how Hilbert's Hotel is constructed: there exists a 'hotel room builder' who has been building hotel rooms at regular time intervals as long as time exists. Suppose there also exists a 'customer generator' which has been generating customers who checked in the hotel at regular time intervals as long as time exists. Suppose that the hotel rooms and the customers continue existing after they have been built and generated respectively. Now if the actual world is one in which the universe is past-eternal, then there would have been an actual infinite number of time intervals, and an actual infinite number of hotel rooms and customers occupying the rooms. In other words, if the actual world were one in which the universe is past-eternal, then there would be a world in which an actually infinite number of things have been actualized (premise D2). The absurd situation which Craig describes would then happen if, for example,

> A new customer comes to the hotel asking for a place to stay when every room is already occupied. In such a hotel, we merely need to shift everybody down a room (so the person in room 1 moves to room 2, and the person in room 2 moves to room 3, etc.). Now room 1 is available for the new customer. This means that, even though every room in the hotel is full, new guests can always be accommodated . . . This, Craig says, is absurd. (ibid., 3)

In the context of the modified HHA, this absurdity would apply to the premise that 'there cannot be a world in which an actually infinite number of things have been actualized' (D1).

In his article, Hedrick discusses the objection that HHA is not analogous to an actual infinite number of past intervals of time for the following three reasons:

(1) 'We're talking about different categories altogether when we use examples about hotel rooms and other physical objects and then apply that reasoning to intervals of time' (ibid., 7).
(2) Unlike customers in hotel rooms, past events cannot be shuffled around (ibid., 11).
(3) Unlike customers and hotels, past events do not presently exist on the presentist ontology.

My modified HHA is not vulnerable to this objection because it is obvious that in the modified scenario, if the actual world is one in which the universe is past-eternal, the absurdity will persist, but if the actual world is one in which the universe is not past-eternal, then no actual infinite number of hotel rooms and customers would have been built and generated and there would be no absurdity. Therefore, the absurdity can be shown to be due to a past-eternal universe.

With respect to Hedrick's worry that on the traditional HHA there would be a parallel argument that shows that the universe cannot be future-eternal from now (ibid., 12), the modified HHA is free from this worry. For on the presentist ontology, events in the future have not yet been actualized, whereas events in the past have already happened and been actualized (Craig (2010), cf. Morriston (2010)). Thus, a universe that is past-eternal would entail the actualization of a hotel with an actual infinite number of rooms and customers, with the resultant absurdity. However, the number of rooms and customers built and generated in a universe that is moving from now into the not yet eternal future is always finite (i.e. the number would be increasing towards infinity as a limit but never gets there), hence there is no resultant absurdity.

Finally, a brief comment on Hedrick's objection concerning the relationship between HHA and (1) the view that there is an infinite number of abstract objects – e.g. numbers, propositions, properties, sets, possible worlds, etc.; (2) David Lewis's modal realism view of possible worlds, where there is an infinite number of concrete worlds; (3) the view that space is continuous, made up of an infinite number of points. With regard to (3), Hedrick writes:

> Craig considers this possibility, but he imagines that his opponent must be trying to use this as a clear counterexample to (A1). His response is to point out that the notion that space is continuous is unproven (Craig & Sinclair (2009), 112). Seemingly, Craig thinks that it's up to his opponent to prove it. But again, Craig's premise seems to entail that space is not like this, which is also an unproven claim. True, if one could prove that continuous space is possible, then we'd have a counterexample to (A1). But since Craig is claiming that it's not possible, it's reasonable to expect him to prove it. (Hedrick (2013), 4–5)

Hedrick seems to have misunderstood the burden of proof. In the context of Craig's opponent trying to use (3) or perhaps also (1) or (2) as a clear counterexample to (A1) which Craig attempts to justify with HHA, the burden of proof is on the opponent to justify (3), (1) or (2) as a genuine counterexample. In this context, Craig does not bear the burden of proof to show that all of these views are not possible; he only needs to show that there is no adequate reason to think that any of these views is metaphysically possible and relevant, hence no adequate reason to regard any of this as a genuine counterexample to his claim, which he justifies with HHA.

In conclusion, with respect to the arguments offered in Hedrick's article 'Heartbreak at Hilbert's Hotel', there is no heartbreak if the Hotel and persons are constructed and generated in the way that I suggest.

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11

Finitism and the Beginning of the Universe

Stephen Puryear

1 Introduction

The argument with which I will be concerned here has a long and distinguished history. Its proponents include John Philoponus (ca. 490–570), al-Kindi (ca. 800–870), Saadya Gaon (882–942), al-Ghāzāli (ca. 1056–1111), St. Bonaventure (ca. 1217–1274), Ralph Cudworth (1617–1688), and Richard Bentley (1662–1742).[1] A version also appears in the proof of the thesis of Kant's first antinomy [1787: B454]. In our own day, the argument has been revived by, among others, G. J. Whitrow [1978] and especially William Lane Craig, into whose *kalām* cosmological argument for the existence of God it figures as a major component [1979: 102–10; Craig and Smith 1993: 4–35; Craig and Sinclair 2009; see also Huby 1971; Conway 1974]. As one might expect, the argument has also elicited a multitude of objections from various philosophers [e.g., Popper 1978; Bell 1979; Mackie 1982: 92–5; Smith 1987; Morriston 2002; Oppy 2006: 137–54]. Despite all that has been said, however, I think it would be fair to say that the dispute has reached something of a stalemate. As with many long-standing philosophical debates, this one has resolved into a clash of intuitions, in this case on the notoriously difficult topic of infinity. Neither side has yielded much ground, and the prospects for further progress seem dim. Nevertheless, I will attempt to advance the debate by sidestepping the clashing intuitions about infinity and by pressing a line of attack that has not yet been fully developed. I will argue that the most plausible response to this attack, the one endorsed by Craig, actually subverts the argument it was introduced in order to save.

2 The argument

The argument I have in mind aims to establish that there is something incoherent in the very idea of a universe such as ours being eternal. The basic idea is this. If the universe had no beginning, then reaching the present moment would have involved something impossible, namely, the traversal of an infinite, or, as Kant put it, the completion of an infinite series by 'successive synthesis' [1787: B454]. But obviously we have reached

the present moment.[2] So the universe must have had a beginning. More precisely, the argument can be put this way:

1. If the universe did not have a beginning, then the past would consist in an infinite temporal sequence of events.
2. An infinite temporal sequence of past events would be actually and not merely potentially infinite.
3. It is impossible for a sequence formed by successive addition to be actually infinite.
4. The temporal sequence of past events was formed by successive addition.
5. Therefore, the universe had a beginning.

In order to fix more precisely the idea of the temporal sequence of past events, let us stipulate that (i) each event in this sequence has the same finite duration, (ii) each event in the sequence includes everything that happens throughout the universe during that period, (iii) the events in the sequence are temporally non-overlapping and (iv) there are no time-gaps between consecutive events in the sequence. Given these simplifying assumptions, it seems clear that if the universe did not have a beginning, then the temporal sequence of past events would be infinite, as stated in (1).

Premise (2) makes the point that if the temporal sequence of past events had no beginning, then it would be actually and not just potentially infinite. Some philosophers appear to have thought otherwise. For instance, Aristotle and many of his followers held that matter (and thus the universe) is eternal. Yet they also disavowed actual infinities; for them, all infinities are potential infinities. From this point of view it would seem to follow that the temporal sequence of past events is only potentially infinite. Similarly, Aquinas upheld the (metaphysical) possibility of an eternal universe while denying the possibility of actually infinite multitudes [1268: 1a.7.4, 75–7; 1271]. He, too, would apparently have denied (2). Against these philosophers, proponents of the present argument have insisted that a beginningless temporal sequence of past events would have to be actually infinite because past events, unlike future events, have actually occurred [Craig 1979: 95–8; Whitrow 1980: 30–2]. An endless future would be potentially infinite, in the sense that time would be always progressing, never ending. But the past is set in stone; so if it is infinite, the thought goes, it must be actually so.

Most critics of the argument have focused on (3), which denies that actually infinite sequences can be formed by successive addition.[3] I will not attempt to survey their objections here; but in order to give the reader a sense of the sorts of considerations which might lead one to embrace (3), let me briefly sketch just one argument for this premise. Consider a sequence of order type ω, such as the natural numbers under the successor function. Though such a sequence can be represented using ellipses (E_1, E_2, E_3, . . .), it would be contradictory to suppose that it could be formed through successive addition, since no matter how many elements might be added, the sequence would perpetually remain finite, indeed would always fall infinitely far short of being actually infinite. However, if it is impossible to form a sequence of order type ω by successive addition, then by symmetry it should be impossible thus to form a sequence of order

type ω^*—i.e., the order type of the sequence of negative integers under *less than*—since the one is just the reverse of the other. Yet ω^* is exactly the order type that the temporal sequence of past events would have if the universe had no beginning. Thus (3).

As I have indicated, many objections have been raised to (3) and to arguments such as the one just sketched. Meanwhile, proponents of our finitist argument have offered replies, most of which are, to my mind, at least plausible if not actually cogent. Neither side has yielded much ground, and the debate has largely resolved into a conflict of foundational intuitions about actual infinities, an issue on which intelligent and mathematically sophisticated people have disagreed. Consequently, we seem to have reached something of an impasse. My goal here is to move beyond the impasse by setting the conflicting intuitions about infinity aside and by criticizing the argument from a different angle. To do so, I first need to introduce an important objection to the sort of finitism of which (3) is an expression.

3 An initial objection

Proponents of the argument under consideration here are finitists, in the sense that they deny the possibility of forming or running through an actually infinite sequence in stepwise fashion. To use the traditional expression, they deny the possibility of traversing an actual infinite. According to some critics, however, this sort of finitism is refuted by the fact that we traverse actual infinites all the time [Morriston 2002: 162; Sinnott-Armstrong 2004: 42–3]. Consider the fact that things move from one point in space to another. In so doing, the moving object passes through an actual infinity of intervening points. Hence, motion involves traversing an actual infinite; and, with all due respect to Zeno, we cannot reasonably deny that motion takes place. Accordingly, the finitist of this stripe must be mistaken. Similarly, whenever some period of time elapses, an actual infinite has been traversed, namely, the actual infinity of instants that make up that period of time. Once again, it cannot be denied that actual infinities are completable. So the finitist scruples upon which the argument against an eternal past rests are misguided. The argument fails.

This objection has merit, but it is not insuperable. In the first place, it assumes that finite magnitudes of space and time are composed of an infinite number of parts, whether unextended, like points or instants, or extended but simple. This yields the result that between any two points in space or time, there is an infinity of intervening parts that must be traversed in order to proceed from the one point to the other. But the finitist need not go along with this. She might instead affirm that space and time are quantized such that any finite spatial or temporal magnitude has only a finite number of minimal parts. On such a view, moving from one point to another would involve moving through only a finite number of intervening spaces, and any finite length of time would involve the occurrence of only a finite number of moments or chronons. In neither case would motion or the passing of time involve completing an infinite. Though Whitrow does not address this objection to his finitism as such, he

does maintain that space and time are discrete, and so I suspect he would defend his finitism along these lines [1980: 200–5]. However, my concern in this essay will be with the other line of reply available to the finitist.

According to this second line, space and time are indeed continuous, but it does not follow that between any two points in space or time there is an actual infinity of intervening parts or points. Instead, there is only a potential infinity of such parts. What makes such a position possible is the view that space and time and other continuous wholes are not *composed* of their parts but are instead *prior* to those parts. Consider the example of a line. It may strike us as natural to think of this line as composed of an infinity of points or infinitesimal line segments set end-to-end, in much the way that a house is composed of bricks. On the alternative view, however, the line is a whole which exists prior to any parts we may discern within it. Rather than being composed of these parts, the line is (in itself) a single whole from which parts are formed when a mind conceives of it as divided. Thus, given that finite minds can only mentally divide a whole a finite number of times, it follows that no continuous whole ever has more than a finite number of parts. More to the point, it follows that motion and the passage of time do not involve traversing an actual infinite, only a potential infinite. Once again, finitism is safe.

This sort of conceptualism about the parts of a continuous whole was at least adumbrated by Aristotle [*Physics,* V.9, 239b5–32; VIII.8, 263a26–b8]. In Leibniz we find it explicitly articulated. He considers the idea of an infinity of points composing a continuum absurd, and so to avoid this absurdity he makes two moves. First, he holds that composed things, such as matter and motion, are not continuous but discrete, even though they are divided to infinity. 'Matter is not continuous but discrete and actually divided to infinity, even if no assignable part of space is devoid of matter' [1705: 327]. Second, he denies that continuous things such as space and time are composed of their parts [ibid., emphasis mine]:

> Yet space, like time, is not something substantial but something ideal, and consists in possibilities, i.e., the order of possible co-existents at any given time. And so *there are no divisions in it, except those that the mind makes, and the part is posterior to the whole.*

For Leibniz, then, nothing composed is continuous and nothing continuous is composed. Instead, continuous magnitudes have parts only in so far as the mind makes them, and since the mind can only ever make a finite number of such divisions, there is no worry that a continuum would be composed of an infinity of points.

In similar fashion, Craig has defended his finitism against the objection raised above, by characterizing space and time as wholes which precede any parts or points we may identify within them [Craig and Sinclair 2009: 112–13; cf. Craig and Smith 1993, 27–30]:

> [T]ime, like space, is infinitely divisible in the sense that division can proceed indefinitely, but time is never actually infinitely divided, neither does one arrive

> at an instantaneous point. If one thinks of a geometrical line as logically prior to any points which one may care to specify on it rather than as a construction built up out of points (itself a paradoxical notion), then one's ability to specify certain points, like the halfway point along a certain distance, does not imply that such points actually exist independently of our specification of them . . . By contrast, if we think of the line as logically prior to any points designated on it, then it is not an ordered aggregate of points nor actually infinitely divided. Time as duration is then logically prior to the (potentially infinite) divisions we make of it.[4]

As with Leibniz, Craig maintains that space and time are divided into parts only in so far as *we* specify such parts. But since we can only ever specify a finite number of such parts, it is false to suppose that an infinity is traversed whenever a thing moves from one point to another or when some period of time elapses. His finitism is thus exonerated.

It is worth emphasizing that, in order for this reply to succeed, the divisions within a continuum must be supposed to exist only in so far as we actually think of them, or, in other words, only in so far as we specify them individually. For otherwise the move would fall prey to an objection raised by Wes Morriston. He admits that the rejection of natural divisions within a continuum is 'probably the best reply available to Craig', but finds it unconvincing because [2002: 162]

> what follows from the lack of natural boundaries within a region of space is not that the infinitely many sub-regions are not actually 'there', but only that they are not 'there' *apart from a specified way of dividing things up.*

Thus, on Morriston's view, the fact that we can specify a rule for dividing a continuous magnitude such as a region of space into parts *ad infinitum* makes it the case that such magnitudes have or at least can have an actual infinity of parts. However, if the divisions within a continuum are there only in so far as we actually conceive them, as both Leibniz and Craig appear to be claiming, and not just in so far as we specify a procedure for conceiving them, then it will indeed follow that any given continuum resolves into only a finite number of parts.

A second point worth emphasizing, one which will loom large as we proceed, is that if continuous magnitudes do not divide into parts except in so far as we conceive or specify those divisions, it follows that space is in itself just *one thing,* that is, an indefinitely extended simple region. As it is conceived by us, space would indeed be divided into a number of smaller regions. But these divisions would exist only in our thought, not objectively or *a parte rei.* The same would be true of time, and, in order to preserve finitism, would have to be true as well of any continuous magnitudes that are traversed in nature.[5]

Apart from the one ill-fated response by Morriston, critics have had nothing to say against Craig's defense of his finitism. However, it is just here, I believe, that things start to go seriously wrong for Craig. As I will argue in the next section, his endorsement of

a conceptualism about the divisions within space and time commits him to a similar conceptualism about *events*. That is, it commits him to the view that all that has happened up till now is in itself just one long event, which divides into sub-events only in so far as we specify or conceive divisions within it. But just as with space and time, this entails that the history of the universe up to the present divides into at most only a *finite* number of temporal parts, even if that history is (actually) infinite in duration. So, ironically, the very move which allows Craig to deflect the objection to his finitism inadvertently undermines the argument that the finitism was supposed to support. That is my argument in outline; now for the details.

4 From time to events

First, some preliminaries. For simplicity's sake, I will restrict myself in what follows to time and the temporal parts of events, though much of what I will say applies equally to space and to the spatial parts of events. As for events, their nature is controversial. As it would take me too far afield to delve into the debates that have transpired in the large and complex literature on this subject, I will instead simply assume the view that events are changes. Besides being (in my opinion) the most intuitively plausible of the theories philosophers have defended, it is the view that Craig himself explicitly endorses and presupposes in his work.[6] Finally, I will refer to the idea that time is prior to any parts we conceive within it as the Priority of the Whole with respect to Time (PWT), the opposing view as the Priority of the Parts with respect to Time (PPT) and the corresponding views about events as, respectively, the Priority of the Whole with respect to Events (PWE) and the Priority of the Parts with respect to Events (PPE). The point I want to make in this section is simply that PWT entails PWE, so that Craig's endorsement of the former commits him to the latter. I will then conclude by arguing that at several points the finitist argument against an eternal past tacitly presupposes PPE, i.e., not-PWE, so that Craig's endorsement of PWT in fact undercuts the very argument his finitism was supposed to support.

As changes, events are intimately bound up with time. They take some time to occur, and typically have both a beginning and ending in time. To have a particular example before us, let us suppose that event E is a certain raising of my right arm which begins at t_1 and ends at t_2. The point I want to emphasize here is that in order for E to be a distinct event—distinct from what was happening with my arm prior to t_1 and after t_2—it is necessary that $t_1 - t_2$ be a distinct period of time. But, given PWT, there is no such distinct period apart from our conceptual activity: as it is in itself, time is just one long duration without any temporal parts, not a sequence of intervals that add up to a longer one. It is due not to nature (*physis*) but to convention (*nomos*) that $t_1 - t_2$ is a distinct part of time. Hence, to the extent that there is a distinct event E, it is not because nature divides the history of the universe up into distinct events; rather, we make those divisions by conceiving of history as so divided. Just as in itself time is merely one long duration, on this view it follows that history is in itself just one long event. PWT entails PWE.

The point can also be made this way: Setting aside spatial complexity, there can only be as many distinct events as there are distinct periods of time. But, according to PWT, there is in nature only *one* period of time, that is, the whole of time. Thus in nature there can be only one event, the whole of history. Any sub-events that we conceive within this one large event do not exist as such in nature; they exist as such only in thought. Let us illustrate this with another example. Suppose, hypothetically, that the universe has existed from eternity past and that throughout this time there has been a certain planet orbiting a certain star at regular (finite) intervals. Given this assumption, it seems natural to think that this planet's motion can be described not just as one infinitely long circular motion, but as an infinite sequence of circular motions, each of which began at one time and ended at another. However, this assumes that time naturally divides into this sequence of intervals, whereas according to Craig this is not the case. Hence we may well conceive of the history of the motion of this planet as an infinite sequence of finite motions; but, as things are in themselves, there is really only one long motion that we conceptualize as a sequence.

The same conclusion can be approached from a different direction. If we take events to be changes, then they are just as infinitely divisible as time. For any such event, no matter how short, can always be divided into two sub-events at any point we like. But if events are infinitely divisible and they are also composed of their (temporal) parts, then they must be not only potentially divisible to infinity but actually infinitely divided. In other words, if the parts are prior to the whole and the whole exists, then the parts must exist. But if the existence of the whole presupposes the existence of the parts, and the parts go to infinity, then there must actually be an infinity of parts. For the finitist, however, this presents a serious problem. For it would entail that any event is in fact an actually infinite sequence of sub-events, so that the occurrence of the event involves the sequential occurrence of all the sub-events. According to the finitist, however, it is impossible for any such sequence of events to occur. Thus, given that events are infinitely divisible, the finitist is forced to say that with events, as with space and time, the whole is prior to the parts. In other words, the finitist is committed to PWE.

The finitist might seek to avoid this conclusion by rejecting the assumption that events resolve into sub-events *ad infinitum*. That is, she might maintain that, while most events, including ordinary large-scale events such as picnics and football games, are indeed composed of a series of smaller events, every such composite event ultimately resolves into a finite number of simple atomic events of some non-zero duration.[7] On such a view, the parts of composite events would indeed be prior to the wholes they constitute. So PPE would hold true. But the resolution of wholes into parts would only go so far. Though temporally extended, the simple events would lack parts and thus would not themselves resolve into any smaller events. Every composite event would therefore resolve into only a finite number of sub-events, and in no case would the occurrence of an event involve the sequential occurrence of an infinity of sub-events.[8]

There is, however, a catch. For in affirming the atomicity of events, the finitist who offers this reply seems to commit herself to the atomicity of time as well. To see why, consider an atomic event E_{1-3} that begins at t_1 and ends at t_3. If the period $t_1 - t_3$ were

not simple, then it would have at least two parts. For simplicity's sake, let us assume it has just two: $t_1 - t_2$ and $t_2 - t_3$. Now if $t_1 - t_2$ is a proper part of $t_1 - t_3$, then it must be a distinct period of time. But in that case, the change that takes place during $t_1 - t_2$ would be a distinct event, E_{1-2}. It would not be necessary to wait until t_3 for an event to have occurred: already by t_2, a period of time would have elapsed, a change would have taken place and thus an event would have transpired. E_{1-2} would therefore be a proper part of E_{1-3}; and, contrary to our original supposition, E_{1-3} would be composite, not simple. What this appears to show is that events cannot be simple and atomic unless time is also simple and atomic, or, in other words, that events must have parts corresponding to the parts of the intervals during which they occur.[9] And this is significant because it means that finitism is now being defended by appealing to the idea that time is discrete. In effect, this reply amounts to an abandonment of the priority of the whole approach in favour of the alternative approach I have already set to one side.

5 Back to the finitist argument

From these considerations, it is clear that any finitist who responds to the objection raised in section 3 by maintaining that continuous wholes are prior to their parts will have to say this not only about time (PWT) but about events (PWE). Yet it is important to realize that if PWE is granted, then the finitist can no longer consistently endorse the argument against an eternal past. For PWE thoroughly subverts that argument. Indeed it undercuts not one but three of its four premises. That argument, the reader will recall, goes like this:

1. If the universe did not have a beginning, then the past would consist in an infinite temporal sequence of events.
2. An infinite temporal sequence of past events would be actually and not merely potentially infinite.
3. It is impossible for a sequence formed by successive addition to be actually infinite.
4. The temporal sequence of past events was formed by successive addition.
5. Therefore, the universe had a beginning.

Now, in the first place, PWE undermines (1). For if events do not divide into parts except in so far as we divide them in thought, then we must admit that just as time is in itself merely one long interval, the history of the universe up to the present is in itself just one long event. To the extent that it forms a *sequence* of events, it does so only in so far as we divide it into parts, and since we can only divide it a finite number of times, it forms at most only a finite sequence. It might be supposed that the past could be divided into sub-events *en masse* simply by specifying a way of dividing it into events of a certain duration: for instance, we could stipulate that the past divides into consecutive events lasting one second each [cf. Craig and Sinclair 2009: 106]. Regardless of what duration we chose, it would follow that, if the universe had no beginning, the past would consist in an actually infinite sequence of such events. This, however, will not

work. As I noted in section 3, the finitist reply advocated by Craig can succeed only if it requires that divisions be individually specified, since otherwise it would be possible to specify an actual infinity of divisions within a finite region of space or time, in the way suggested by Morriston [2002: 162]. But the very same move that allows the finitist to block Morriston's objection also prevents the finitist from using a similar strategy to specify an infinity of divisions within the history of the universe. Hence, given PWE, premise (1) of the original argument is false. Even if the universe had no beginning, it would not follow that reaching the present involves traversing an infinite multitude. At most it would require traversing an infinite *magnitude,* something to which finitists have typically raised no objection.

In addition, PWE impugns premise (2), the claim that an infinite temporal sequence of past events would be actually and not merely potentially infinite. For if the universe had no beginning, and its history is in itself just one long event which we divide in thought, then the temporal sequence of past events into which that history divides would be not actually but only potentially infinite. It would be actually finite, but always further divisible and thus potentially infinite. From this point of view, Aristotle and Aquinas were in a sense right to hold that an eternal past would be only potentially infinite.

Finally, PWE undercuts premise (4), according to which the temporal sequence of past events was formed by successive addition. To characterize the past as a sequence of events *formed by addition* is to presuppose that the parts are prior to the whole (PPE). But if the whole is in fact prior to the parts, then the temporal sequence of past events is formed not by addition but by *division.*

In view of these points, I conclude that Craig's response to the anti-finitist objection introduced in section 3 thoroughly undermines the very argument that finitism was supposed to support. The possibility, of course, remains that space, time, and change (events) are discrete. I have not attempted to cast doubt on this alternative, and so I cannot claim to have refuted the original argument *tout court.* However, I have argued that Craig's position is incoherent and that, in a way not previously noticed, the finitist argument for a beginning of the universe tacitly presupposes that space, time, and change are discrete. Whether this latter position is plausible I will not take up here; but, given how widely philosophers and physicists have affirmed the continuity of space and time, this has to be considered a serious mark against the finitist argument.[10]

Notes

1 On the history of the argument up through the seventeenth century, see Whitrow [1978], and Craig [1979:1–49].

2 Though I have found it helpful in introducing this argument to rely on the premise that we have reached the present, this is not essential to the argument and does not appear in the more precise statement, which makes no reference to the present at all.

3 An alternative and historically less prominent version of the argument relies instead on the premise that there can be no actually infinite multitudes in nature. The points I will be making in section 3 and beyond apply equally to this other version.

4 I assume that when Craig speaks of time *simpliciter* in this passage and throughout his discussions of the finitist argument, he means duration in all its forms, which for him includes relative physical time (i.e., local time), absolute physical time (i.e., cosmic time), and absolute metaphysical time (i.e., God's time) [Craig 2001: 118–19, 202–40].

5 As an anonymous referee points out, Craig's doctrine that time logically precedes the divisions we specify within it raises some thorny questions in connection with his presentism. For instance, why should we think that only present things exist, when the division within time between past and present is merely one *we* make? Do *we* determine what no longer exists by the way we divide time in thought? These are important questions, though I will not explore them here.

6 See Craig [1979: 95]; Craig and Smith [1993: 24]; Craig and Sinclair [2009: 106]. For an extended discussion and defense of the view that events are changes, see Lombard [1986: 79–186].

7 That these atomic events could not be instantaneous follows from our assumption that events are changes and thus take some time to occur.

8 Craig entertains a reply along these lines [Craig and Smith 1993: 27–9], but sets it aside in order to press instead the point that 'Time as a whole duration is . . . logically prior to the (potentially infinite) divisions we make of it' [ibid.: 29].

9 A similar principle, that any physical object must have parts corresponding to the parts of the region it occupies, has recently been denied by a number of philosophers [e.g., Markosian 1998; Simons 2004; McDaniel 2007]. I sympathize with these dissidents; however, it seems to me that the dynamic nature of events renders the event-analogue of this principle, that an event must have parts corresponding to the parts of the period during which it occurs, considerably more difficult to deny. I would like to thank an anonymous referee for pressing me to clarify this point and for comments which led to significant improvements in my treatment of the finitist reply under consideration.

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12

Traversal of the Infinite, the "Big Bang," and the *Kalām* Cosmological Argument

David S. Oderberg

Introduction

The last twenty years have seen the efflorescence of debate over one of the most famous arguments for the existence of God, the *kalām* cosmological argument (KCA). This extraordinary revival of interest is due almost wholly to the work of William Lane Craig, and the debate he has generated has been pursued through the pages of numerous journals, including those in philosophy of science and philosophy of religion.[1] From the point of view of philosophical cosmology, debate over the KCA has helped to crystallize interest in a range of issues—such as the nature of infinity, its relation to time and space, the origins of the universe in general and the nature of the so-called Big Bang in particular—which, arguably, have not been given enough attention by philosophers, whatever the status of such issues as the jealously-guarded preserve of mathematicians and theoretical physicists.

Needless to say, given prevailing views in the philosophy of religion, virtually all of the responses Craig has provoked have been critical, if not hostile. His principal critic has been Quentin Smith, and much of the recent debate has revolved around the fascinating dialectic between these two formidable thinkers. To discuss even a decent portion of the arguments and counterarguments which have been raised in respect of the KCA would be impossible in one paper. Such a paper could only be the briefest of surveys, and would not add anything significant to the debate itself. The aim of the present paper is far more limited: to concentrate on only two aspects of the KCA, with the purpose of determining whether, in these two matters alone, Craig or his critics have the upper hand.

The Argument

The essence of the KCA is its claim that an infinite regress of events is impossible. Two sub-arguments are proposed to support this claim. We have:

(A)

(A1) An actual infinity cannot exist.

(A2) An infinite temporal regress of events is an actual infinity.
(A3) Therefore, an infinite temporal regress of events cannot exist.

(B)

(B1) A collection formed by successive addition cannot be actually infinite.
(B2) The temporal series of past events is a collection formed by successive addition.
(B3) Therefore, the temporal series of past events cannot be actually infinite.

Each of A3 and B3 imply:

(C) The temporal series of past events is not infinite.

(C) implies:

(C1) The universe began to exist.

But:

(C2) Whatever begins to exist has a cause of its existence.

Therefore:

(C3) The universe has a cause of its existence.

and:

(C4) The cause of the existence of the universe is God.

Sometimes in the debate, the KCA is identified solely with what might be called the "master argument" (C1)-(C3), but since the sub-arguments (A) and (B) are, in the Islamic tradition, crucial to defending (C1), and are what give their version of the cosmological argument its flavor, as it were, the KCA is identified here with the complex of arguments (A), (B) and (C1)-(C3).

Now, it should be noted that (C) implies (C1) because the universe just *is* the temporal series, or chain, of past events. This seems strange, because normally when we think about the universe we think about the collection of *presently* existing *objects,* including space and time themselves ("object" being interpreted in the widest possible sense). The KCA admittedly uses a slightly different concept of the universe, at once broader and narrower than the standard one: narrower, in that it is the concept of the chain of *events* rather than of objects; broader, in that it is the concept of the chain of all events up to the present, rather than just the events of the present. But this different use of the term "universe" should not give grounds for suspicion. As far as the concentration upon events is concerned, two things must be noted. First, what the KCA does is to *abstract* from the totality of things which make up the universe: in fact, the universe contains events, objects, processes, and more besides, and the KCA does not deny this. Rather, it focuses upon those things in the universe which are directly relevant to the question of whether the universe had a beginning, more particularly upon those things which are relevant to the question of whether the universe can be proved to have a beginning from a consideration of the infinite. Secondly, an event is best defined as a *change* in an object or objects, so that in considering the chain of past events objects do not leave the picture—what is examined is whether the

series of changes in objects up to and including the present can be infinite. As far as the concentration upon the past is concerned, a complete inventory of the universe must include those things which occurred or existed before the present, even though our standard talk about the universe does not normally include those things. The assumption the KCA makes, though, is that the past is *real*; otherwise it could not be considered part of the universe, which is the totality of real things—and this does not, for instance, include the future in any obvious sense. Note that by making this assumption the defender of the KCA is not implying that a tenseless theory of past and present must be true (let alone a tenseless theory of time in general).[2] The point can be phrased by saying that the past is timelessly real: the Battle of Waterloo, for instance, is (timelessly) a real event, though as far as tense goes it is not *now* real, rather it once *was* real—it really happened—and it is in virtue of this tensed fact that it has reality at all.

Which past events does the KCA consider? The answer is *all* events, but we can without loss omit a consideration of the branching structure of the series of past events, and think of the universe as a succession of transitions (which are events) from one total state of everything at a time to another. In this way, the universe is just a chain of events. This is consistent with the possibility, if it *is* a possibility, that not every total state is a state of *material* things. It allows that matter may have come into existence at one time, but that the universe existed before then, in a quiescent state, until the beginning of material events (i.e., events involving material objects).[3] The point about events being changes in objects disappears on this scenario, which counts the simple *effluxion of time* as a series of events (i.e., transitions from moment to moment). Naturally, suspicions might be aroused about such a view since it divorces time from change and motion. But the point is that the KCA is neutral on the matter. Even if a quiescent universe is a possibility, then although it could not be identified with the chain of material events, it would still be identified with the chain of events simpliciter, since the passage of time without matter or motion would involve events (i.e., transitions from one moment to the next—time would still *elapse*).[4]

From the above statement of the KCA it should be clear that the battle is fought on several fronts. Of the two sub-arguments (A) and (B), the most attention has been given to (A)—the debate over whether there are actual infinities. This question hinges on, among other things, the proper interpretation of Cantorian transfinite set theory, the nature of mathematical reality, and the paradoxes of the infinite. Questions of Aristotelian exegesis are also relevant. The present paper will not examine the debate over (A).[5] Rather, it will assume for dialectical purposes that there are actual infinities, or at least that they are not logically impossible. The focus of examination, instead, will be the more neglected (B)—that even if there *were* actual infinities they could not be formed by successive addition, which means that the past could not be actually infinite because it *is* formed by successive addition. Following consideration of (B), we will end with an examination of (C1)-(C3)—the argument that the universe must have a cause of its existence.

The formation of an actual infinity by successive addition

The notion of "successive addition" is highly abstract. Sometimes the thought behind (B1) is expressed by the idea that the infinite cannot be "traversed"; sometimes, more prosaically, by the notion that one cannot count to infinity. There is but one thought at work here. An actual infinity, it is argued, has to be given all at once or not at all, and by "all at once" is meant "simultaneously." To take the case of an infinite library, discussed by Craig—which he dismisses as impossible since he denies the existence of actual infinities, but recall that we are assuming their possibility for the purpose of argument—if such a thing were to exist, all of its books would have to have come into existence (or been put on the shelves, say by an omnipotent being) at precisely the same time. The only alternative is that the library was formed by the coming into existence, or putting onto the shelves, of the books at successive intervals.[6] But if it were done at successive intervals, at no moment *in principle* could it be said that the infinite library existed, only that it was under construction. And a library under construction is not, by definition, a completed library. Hence an infinite library under construction is not a completed infinite library. To be so, it would have to contain an infinite number of books, which it never does at any moment in its history.

Now it might be thought that the KCA is just the traditional cosmological argument of medieval scholasticism. Craig goes so far as to say that "[t]he *kalam* argument is simply the old first cause cosmological argument."[7] Now whilst it is fair to call the KCA a species of what is generically called the Cosmological Argument, Craig's identification seems to me hasty. First, as far as the position of St. Thomas Aquinas is concerned, the KCA makes certain claims about the nature of the past which he does not appear to share.[8] Secondly, the "old first cause cosmological argument," which is embodied in the first two ways of Aquinas's celebrated Five Ways, is based firmly on a consideration of causality.[9] Argument (B) of the KCA, on the other hand, does not rely essentially on any considerations to do with physical causation. As we saw above, even in a universe without material events but only the effluxion of time, the regress of past events, consisting in transitions from moment to moment, could not be infinite according to the KCA. The distinction can be brought out by considering the familiar metaphor of the moving train with an infinite series of carriages, and yet driven by an engine at the rear. In response to the question "What is moving the train?" you are told, "The engine." But when it is added that the engine is infinitely far away, you are unlikely to be impressed. You cannot, *in principle,* observe the engine. To be told that the train is driven by an engine that is infinitely far away, that you could not in principle ever find, is not to be given a satisfactory response to the question "What is moving the train?" since that question does not ask merely for an existential proposition, but for a *physically realizable* description of what it is that is *moving* the train. What is essential to the scholastic cosmological argument, understood in terms of this metaphor, is the concept of physical movement. Think of the engine of a finitely long train driven from the rear as moving the carriage immediately in front of it by communicating energy (or momentum) to it, which carriage then transfers energy to the next, and so on, up to the

front carriage, with the result that the whole train moves. This is a physically realizable scenario. By contrast, if it is carriages all the way back, how does the requisite energy ever *reach* the front carriage, and so how can it—and hence the whole train—move? To say that it moves in virtue of an "infinitely distant engine" is quite misleading, as both J.L. Mackie, who criticizes the KCA, and Craig, both implicitly realize in their respective critiques of the notion of an "infinitely distant starting point" in the regress of past events.[10] An infinitely distant engine is no more a kind of engine than, to take the familiar analogy, a rubber duck is a kind of duck. To say the engine is infinitely far away is simply to say that it is carriages all the way back, and thus that there *is* no engine. So the question is: how can the energy ever cross infinitely many carriages and so reach the front one?

Whereas the scholastic cosmological argument relies on the concepts of physical motion and cause, the KCA relies on the bare concept of successive addition or traversal. Suppose, then, that you saw the first twenty carriages of a *stationary* train stretching back as far as the eye can see. You ask, "How was the train constructed?" The response you are given is that the train was constructed carriage by carriage. On this version of the thought experiment it is irrelevant whether some being placed one carriage after another, or whether the carriages sprang into existence miraculously one after the other. The point is the same—that such a train could never, *in principle,* come into existence, ending with the first carriage you see before you. No concepts of physical motion or cause are employed, either explicitly or implicitly, in this version of the thought experiment. The only concept necessary is that of successive addition. Further, the sort of addition that is contemplated is not necessarily the *material* addition of material object to material object—although in the case of the train the addition is indeed material. All that is needed is the concept of addition *in time,* which covers the formation of any series of temporal things, be they objects (material or not) or events (material or not). Going back to the KCA, then, it might be objected: since the argument is claimed to cover the formation of the series of past temporal intervals without material events, how can that series be formed *in time*? That would be to say that the temporal series is formed in time, which is absurd. The reply is to deny the absurdity, as long as the formation is properly understood. The KCA does not claim that time is formed in time, if this is supposed to mean that a medium is formed in a pre-existing medium with which it is identical; this would indeed be absurd. The claim is, rather, that the past temporal series is formed by the addition of temporal intervals to preexisting temporal intervals, a process that is, trivially but nonetheless truly, temporal. Monday follows Sunday in time, in the sense that the pre-existence of Sunday makes possible the existence of Monday by successive addition. The same goes for the succession of any interval by another, whether there are material events taking place during that interval or not. (In the *broad* sense this succession is also a physical succession because time itself, its behavior, its flow, its direction, and so on, are subject to the basic laws of physics, whatever they are, and are hence described physically.)

Once it is appreciated that the KCA has broader scope than the scholastic cosmological argument—which may lead to the view, which we cannot explore here, that the latter is in a sense no more than a special case of the former—and hence that

the KCA is not dependent logically on any concept of physical cause or motion,[11] we can return without fear of misinterpretation to thought experiments that have a material element. And the one to which Craig and his critics devote most attention is a variant on Bertrand Russell's Tristram Shandy paradox (hereafter TSP).[12] Suppose it takes Tristram Shandy a year to record one day of his life. Could he finish his autobiography? According to Russell, "if he had lived forever, and not wearied of his task, then, even if his life had continued as eventfully as it began, no part of his biography would have remained unwritten."[13] Is this claim "wholly untenable," as Craig maintains? There is some confusion here, since the reason he gives is that the future is a potential infinite, not an actual one. This is correct but irrelevant; for, as Craig himself says, this part of the KCA *assumes* the possibility of an actual infinity, and questions whether it could be formed by successive addition. So, let us assume the future is an actual infinity: is Russell's claim true? Yes, but again not in a sense relevant to the question "could Shandy finish his autobiography?" Immediately before the passage quoted, Russell questions whether Shandy could "come to an end," so the passage seems to be a reply in the affirmative. However, he cannily does not make an explicit equivalence between the claim that Shandy could come to an end and the claim that no part of his autobiography would remain unwritten. These propositions are indeed *not* equivalent. To infer the former from the latter would be to commit the quantifier shift fallacy which is often found tacitly in writings on the infinite, here taking the form of an invalid inference from

(1) For every day, there is a year such that: by the end of that year Shandy has recorded that day.

to

(2) There is a year such that, for every day: by the end of that year Shandy has recorded that day.

If Shandy is to "come to an end," as Russell puts it, (2) would have to be true, not merely (1). But here Craig argues correctly that it cannot be true. Far from Shandy's getting closer to the finish, he gets further and further behind, so that he approaches being *infinitely* far behind, and given the assumption that the future is actual, he *is* infinitely far behind. And if the future is not actual (as it is not), Shandy fares no better, since (2) is still not true and Shandy merely approaches being infinitely far behind. Whichever way we view the future, Shandy could not finish—either he is actually writing forever, and moreover getting further and further away from finishing, or he *could* do so. The fact that the days of his life and the years available for writing can be put into a one-to-one correspondence does not alter these facts.

What is more important for the KCA, however, is Craig's variant on TSP. So far we have considered the case of Shandy's writing throughout the future, as Russell originally put it. Let us call this "TSP_f" (for "TSP forwards"). But what if we imagine Shandy's having been writing from eternity past? (Call this "TSP_b".) Could he complete

his life story? Here again Craig does not at first make it clear what we are supposed to imagine. What we are asked to reconcile is in fact the two parts of the following scenario: (1) we see Shandy before us, putting the final full stop to the final page of the last day of his autobiography; (2) Shandy has been writing for an infinitely long time. Are (1) and (2) compatible? The first obvious point Craig makes is that they are not because every day of Shandy's life generates another year's work, so he could not have yet recorded the day on which we see him writing![14] What he also claims, however, is that a one-to-one correspondence can be established between the days of Shandy's life and the years in which he records them, thus showing "the bankruptcy of the Principle of Correspondence in the world of the real."[15] Shandy has, it seems, an infinite number of years to complete the task, but it cannot in principle be completed, so (1) and (2) are incompatible.

Here Craig has erred, since the years and days cannot be put into a one-to-one correspondence.[16] First, consider TSP_f, where the *n*th year of writing records the *n*th day. If Shandy has been writing for, say, three years, he has recorded three days, but has accumulated $(365 \times 3) - 3 = 1092$ days; and in general, if he has been writing for n years he has recorded n days but accumulated $(365 \times n) - n$ days, with the days accumulated increasing per year in 364 day increments.[17] What makes a one-to-one correspondence between days and years possible, however, is that there is a fixed starting point, the first day of Shandy's life which he does not begin recording until the next day. On the scenario provided by Craig for TSP_b, however, there is no such starting point, and this makes a one-to-one correspondence impossible. Suppose we take some two-year section of Shandy's life, and want to know what day the second year recorded. It seems we could make the correspondence in an infinite number of ways, not restricting ourselves to days in the immediately preceding year. More accurately, though, the problem is that without a fixed starting point we cannot even say *in principle* which year corresponds to which day. Thus Craig is wrong to reply that it is "merely an anthropocentric limitation" which prevents us matching years and days;[18] without a fixed starting point no matching *can* be established, and there is nothing we *could* know which would make a difference.

What about Craig's initial point, that Shandy could not have recorded the day on which we find him supposedly putting the final full stop to the final page of his life story? Although the point holds in the case we have just been considering, reflection shows that it is not the way in which TSP_b should be represented, as it is not the true reverse of TSP_f. A true reversal would involve any year's *preceding* the day which it recorded. This is absurd, however, since it means Shandy's recording the days of his future! Nevertheless, it is a model taken seriously by Ellery Eells,[19] who uses it to claim that TSP_b is after all consistent with an infinite past. His mistake, though, is to suppose that the only consistency required of a model intended to apply to the real world is mathematical consistency. What he omits to consider is that it would be *logically impossible* for Shandy to record his future (as opposed to, say, speculating about it), on the assumption that there is nothing to record until his future is lived. And even if, *per impossibile,* his future was in some sense real and so recordable by Shandy—who, let us suppose, has had a revelation of his future—the recording of it would have to

stretch back to infinity, since part (2) of the TSP_b scenario is that Shandy has been writing from eternity past. So he must also have an eternal past. Since, however, there must (for Eells's story to be mathematically consistent) be a point—even if it is in principle impossible to say which—when Shandy is no longer writing about his future but about his past, it follows that he cannot finish his autobiography because he needs an infinite time to record his infinite past. And this logically contradicts part (1) of TSP_b, that he has finished. But if we suppose him to have finished—by completing the record of his past, having already completed recording his eternal future—then he *cannot* have had an infinite past, which logically contradicts part (2), that he has been writing from eternity. From which it is concluded that Eells's story, whilst mathematically consistent, does not escape logical inconsistency, not to mention the absurdity of supposing that a person could record their future, a point on which Craig rightly takes Eells to task.[20]

For a true model of TSP_b which is isomorphic to TSP_f we need to refer to an ingenious proposal by Robin Small, one not considered by Craig.[21] Suppose Tristram Shandy *plans his life in advance,* and it takes one year to plan a day. The model then will be a genuine reversal of TSP_f, with a one-to-one correspondence capable of being established between days lived and years of planning. Further, it seems both (1) and (2) of the TSP_b scenario are satisfied: Shandy has lived (and planned) from eternity, and genuinely completes his planning with the last day of his life, no day being left unplanned.[22]

Does Small's model of TSP_b prove, then, that the infinite can be traversed and hence that the Tristram Shandy paradox cannot be used as an argument against the idea of an infinite past? It does not, but before it is shown why, some further remarks need to be made. Small's critique of Craig's model destroys any notion that Shandy could have finished his life story if he had written from eternity. One of Craig's objections to TSP_b is that if Shandy has been writing from eternity, why did he not finish his autobiography yesterday or the day before, since by those times an infinite duration has also elapsed?[23] And the same goes for any time in the past. So at any time, Shandy should have finished, which means that at *no* time could he have finished, contrary to assumption (1) that he *has* finished. Now Smith concedes as much, saying, "at no point in the past, and at no present, will Tristram Shandy's autobiography be complete." But he immediately adds the conclusion: "The story of Tristram Shandy is internally consistent and so is the idea of an actually infinite past."[24] How, one might ask, can it be internally consistent if one of the assumptions is that there *is* a time by which Shandy has finished? Again, we have Small saying: "we need not infer from the fact that Tristram Shandy has been writing from an eternity that he has written his last page. The argument I have set out [that no one-to-one correspondence is possible on Craig's model] justifies a stronger claim. It demonstrates that we *cannot* make both assertions."[25] In other words, (1) and (2) are inconsistent. And yet both assumptions *have* to be made if the paradox is to be at all relevant to the question of whether an infinite past can be traversed, because the assumptions are supposed to generate a model which proves that it *can.* Connected with this is Smith's objection that, while Craig supposes that because Shandy has had an infinite time to write, he should have finished at the end of every day, and hence

not finished at all, there is no reason to suppose in the first place that he should have finished.[26] For, asserts Smith,

> it is false that the proposition "The number of past days written about is the same as the number of past days" entails "There are no past days unwritten about." For, the number of past days written about is a proper subset of the infinite set of past days, and a proper subset of an infinite set can be numerically equivalent to the set even though there are members of the set that are not members of the proper subset. . . . [S]o the infinite set of past days has the same number of members as its proper subset of days written about, yet has members that are not members of this proper subset (these members being the days unwritten about).[27]

By what right, one might ask, does Smith claim that the set of days written about is a proper subset of the set of past days? He gives no reason at all for such an assertion; moreover there *is* no reason. Nothing in Craig's thought experiment gives reason to think that the relation between the set of days past and the set of days written about is analogous to that between the set of natural numbers and the set of even numbers, as Smith explicitly claims; Craig gives no comparable principle of selection. Shandy may get infinitely far behind, which as we noted already is an absurdity inherent in the story as Craig tells it, thus supporting his case; but this does not seem to be what Smith is referring to.[28] What he *is* referring to is a mystery, and it is not to be wondered at that he later retracts this objection, though without further explanation.[29]

Now we have just seen that Craig raises a further objection to TSP_b, and it is clear that the objection applies both to his own (inaccurate) and Small's (accurate) models. His claim is that Shandy should have finished at any time in the past, since at any time he has written for an infinite period. It is not clear, however, exactly what Craig's claim amounts to. David Conway goes through various possibilities, only to dismiss them all.[30] Craig might mean that any infinite period in which Shandy has been writing must include the last page, so he should have finished at any time in the past, and so not at all. This Conway plausibly rejects on the ground that an infinite series of days of writing does not *have* to include the day of writing the last page in order to be infinite, as opposed to a finite series which would, of course, not have the same cardinality if it lost a member. Another possible interpretation of Craig is that he is claiming that all possibilities are realized during an infinite period of time. This too is rejected by Conway principally on the ground that it assumes the world is "a sort of giant dice game in which events happen 'at random.'"[31] We might accept as an explanation for a zero's coming up on a roulette wheel that the wheel had been spun a large number of times (Conway uses the example of a fair die rolling a six, which is less plausible since not many rolls would be needed for that number to come up), but we would not accept, say, the occurrence of an earthquake as explained by the fact that it was a possible event and there had been many events.

Formulated in terms of the actualization of possibilities, the debate between Craig and his critics is somewhat obscure. Craig's point, however, can be formulated in terms which he himself does not use but which, it is submitted, capture its essence. What

needs to be invoked is the Principle of Sufficient Reason. Now there is much controversy about how the principle is to be interpreted, and whether various interpretations yield a plausible proposition. In its most innocuous form, however, it embodies a truth which it would be hard to deny:

(PSR) Every event has an adequate explanation.

Certainly, it looks as though Conway himself subscribes to this principle: his remarks noted in the previous paragraph suggest just this. Presumably, we would accept the occurrence of a large number of spins of the roulette wheel as adequately explaining the coming up of zero precisely because that explanation was grounded on reasonable statistical inference (in particular, the law of large numbers). We would not, on the other hand, accept similar reasoning in the case of an earthquake because, as Conway says, "we take it that we live in a world of causal connectedness, a world in which events happen because there are *sufficient antecedent conditions* for their happening. The 'random model' is not one that we are willing to accept as a reflection of how things are."[32]

How, then, does PSR apply to Craig's objection that on TSP_b Shandy should have recorded every day of his life at any time in the past, and hence not done so at all—or rather, using Small's model, that he should have planned every day of his life, and hence not done so at all? The thought is that there is no *adequate explanation* for Shandy's having completed his task *now* rather than yesterday, or the day before, or . . . . The fact that he has "had long enough" does not suffice, for the very reason Conway advances. But what else could explain the precise time of his finishing? Not the Principle of Correspondence, as Craig points out, because whatever time in the past we select as a possible finishing time, that and all prior days can be correlated; so as far as the principle is concerned, any finishing day is as good as another. But it is hard to see what else can be advanced as an adequate explanation of Shandy's finishing at one time rather than another. Yet part (1) of the paradox just is the hypothesis that he *does* finish at a particular time. Since the hypothesis, in conjunction with part (2), violates the Principle of Sufficient Reason, we must take the paradox as not being realizable, as not, in Conway's words, a "reflection of how things are." The logic of this reasoning is easily stated. Let the predicate "E(φ)" stand for the sentence functor "There is an adequate explanation of the fact that φ." Let the variables "φ" and "ψ" range over propositions about events to be explained. Now let us assume

$\sim E(\varphi) \ \& \sim E(\psi)$

from which we can infer

$\sim E(\varphi \ V \ \psi)$

on the plausible assumption that if neither of two events have an adequate explanation, there is no adequate explanation of their disjunction. (Example: there is no adequate explanation of the fact that I am ill, and no adequate explanation of the fact that I failed to submit my paper, so there is no adequate explanation of the fact that either I am ill or failed to submit my paper.) Now, let us replace "φ" with the constant "*f*" (which stands for "Tristram Shandy finishes at t_0") and "ψ" with "*g*" (which stands for "Tristram

Shandy finishes at t_{-1}"). On the hypothesis that there is no adequate explanation for the fact that Shandy finishes at t_0 and not t_{-1}, and no adequate explanation for the fact that Shandy finishes at t_{-1}, and not t_0, we have

$\sim E(f \,\&\, \sim g) \,\&\, \sim E(g \,\&\, \sim f)$

from which we infer

$\sim E((f \,\&\, \sim g) V (g \,\&\, \sim f))$

as above. But then we can then infer

$\sim E(f V g)$

and hence that there is no adequate explanation of the fact that either Shandy finishes at t_0 or at t_{-1}.

I conclude, then, as follows. Small's model accurately represents Russell's Tristram Shandy paradox in the backwards direction. A one-to-one correspondence can be established between the days of Shandy's life and the years of his planning each day. There is no internal inconsistency inasmuch as assumptions (1) and (2) of the model are compatible. Together, however, they violate the Principle of Sufficient Reason taken in its least controversial form. Craig is, therefore, quite correct to argue that the paradox supports his contention that the infinite cannot be traversed.

Before leaving the question of traversal of the infinite, some final remarks are in order. The inherent absurdity of TSP_b, given its violation of PSR, calls to mind the suggestion by Wittgenstein that if we came across a man saying, "5, 1, 4, 1, 3—finished!" and were told in response to our question of what he was doing that he had just finished reciting the complete decimal expansion of π backwards, which he had been doing for eternity past, we would find the scenario inherently preposterous.[33] It is not so much that we would balk at the idea of immortality *per se*; rather, we would resist the notion that he had lived from all eternity only to arrive at the present, and a fortiori that he had performed the task of reciting an infinite series during that time. Not surprisingly, Craig too finds such a scenario absurd, citing the case of a person's having recited the series of negative numbers backwards, so that we find him saying, "−5, −4, −3, −2, −1, 0—finished!"[34] Applying the scenario to the case of the universe considered as a chain of events stretching back into the past, the absurdity is no less apparent. Could that chain be infinite? But then how could the present moment ever arrive? Simply adding moments gets you nowhere, since no amount of additions of moments gets you to a given moment if the addition does not begin at any specific moment. In other words, it is no answer to the question simply to say "by effluxion of time" since no amount of effluxion produces an infinite temporal series, and hence necessarily does not produce the final term in such a series, which we call the present. To say that the hypothesis of such a series violates PSR amounts to the same objection. For if there is no adequate explanation of how the series can terminate at any specific point, there is no adequate explanation of how it can terminate *tout court*.

This view of things, as already noted, is supported by G. J. Whitrow, whose argument for the finiteness of the past draws in large part on the insights of Kant.[35] For Whitrow as for Craig, a set of order type $*\omega$, the order type of the negative numbers, is nonconstructible. We can frame this point in more graphic terms by means of a thought experiment.

Suppose you are an immensely powerful being, not necessarily infinitely powerful like God, but powerful enough to create a universe. However, you are limited in one special way. The only way you can create a universe is thus: every time you pronounce a negative number, a state of the universe comes into existence. (Instead of saying, "Let there be X," you say, "Negative *n*" for some number *n*). More precisely, if you pronounce successive negative numbers, you create successive states: the utterance "$-n$; $-m$" ($n > p$) produces states S_1 and S_2 respectively (S_2 later than S_1). You only complete the universe once you have reached 0, which we call the present.[36] Can you create the universe? Only if you can get through all the negative numbers. But how can you do this? It might be replied: "although an extremely powerful creature could not do it, a genuinely omnipotent being—God, if you will—could." The reply raises an important issue, about the extent to which God can supply an adequate explanation for that which otherwise has no adequate explanation. The paradigm example of this is a miracle, but it would be hasty to claim that divine action in and of itself could traverse the negative numbers ending at 0. First, we must not confuse the eternity of God—in the sense of timelessness—with the eternity we have been considering, which is constituted by infinite past time.[37] It does not follow from the fact that God is timeless that He can traverse infinite past time. Secondly, it is not clear that even a miraculous traversal of the infinite would be possible, because of the very nature of the task. In the case of a miracle, God supplies the causal efficacy lacking in nature. But His action is still constrained by what is logically possible in the broadest sense. For instance, it is doubtful whether God could create a rational mountain any more than He could make 2 + 2 = 5, because of the very natures of a mountain and of rationality. It is at least arguable that the impossibility of the divine traversal of the infinite would be akin to that of His making a rational mountain because of the very nature of time itself, or, to borrow Kant's apposite phrase, of a "successive synthesis." There would no more be an adequate explanation of why the infinite series of order type *ω terminated at t_0 rather than t_{-1} if it were postulated that God did it, than there would be of the putative existence of a rational mountain if divine action were invoked. Still, it must be emphasized that these are highly speculative suggestions whose further exploration would take us too far afield. Suffice it to say that Craig's critics are unlikely to find much comfort in the thought, if it were true, that the only way the infinite could be traversed were if God did it.

Another response which is frequently heard from Craig's critics, most notably Smith, involves insisting that "although such a series [infinite in either direction] can never be completely synthesized in a finite time, it can be completely synthesized in an infinite time."[38] But insisting that something is so does not make it so, no matter how many times one repeats the claim. It is here that Aristotle's famous distinction between process (*genesis*) and activity (*energeia*) is of some use.[39] A process has an object, a terminus such that once the terminus is reached, the object is achieved. An activity, by contrast, has no object and no terminus—logically, it could go on forever. The formation of an infinite series by successive addition is not a process, but an activity; and the formation of a finite series is not an activity, but a process. The latter has an object—the completion of a survey of every member. The former has no object, since the survey, *of its very nature,* cannot be completed. For Smith to assert that an infinite series can be "completely synthesized" in an infinite time is to distort and to misuse

language. It may not be a distortion to say that, in an infinite time, every member of an infinite series is surveyed; but it is another thing entirely to say, or to imply by one's use of words, that the survey is able to be completed. A process, of its very nature, comes to an end in time *with its object achieved,* or at least is capable of doing so; an activity, of its very nature, cannot. The critics' response is to accuse supporters of the KCA of confusing the finite with the infinite, of requiring for the infinite what can only be achieved by the finite, of having, in Mackie's words, echoed by Graham Oppy,[40] a "prejudice" against the actual infinite. Oppy goes so far as to say that by the claim that it is impossible to traverse an infinite with no first member, Craig merely *means*—tautologously—that an infinite with no first member is objectionable because it has no first member. This latter charge is mystifying.[41] It is one thing to argue, as Craig does, that an infinite series cannot be traversed *because* it has no first member, and another entirely to *mean* by "It cannot be traversed" that it has no first member. Pigs cannot write poetry because they do not have language; but "Pigs cannot write poetry" does not *mean* "Pigs do not have language." That they cannot write poetry is a *consequence* of their not having language. Similarly, the untraversable nature of an infinite series with no first member is a *consequence* of its having no first member, hence it does not follow from the assertion that both obtain that they say the same thing.

Nor could any of the other accusations mentioned above be further from the truth. On the contrary, the supporters of the KCA know only too well the essential difference between the finite and the infinite. It is *precisely* that difference which they invoke in support of their contention that an actual infinity cannot be formed by successive addition. By contrast, it is those who believe that the infinite *can* be traversed who are guilty of confusing two fundamentally distinct sorts of entity. And in doing so, they make a basic confusion between the metaphysical categories of process and activity, they misuse language, they distort perfectly comprehensible concepts, and they do injustice to the idea of the infinite itself in their futile quest to force it into the Procrustean bed of a real but all-too-finite world.

John Hospers, himself, as Craig describes, "no friend of philosophical theism," comments on the problem of the traversal of the infinite past in these words: "if an infinite series of events has preceded the present moment, how did we get to the present moment? How could we get to the present moment—where we obviously are now—if the present moment was preceded by an infinite series of events?"[42] He concludes that the problem has not been solved, and passes on to other arguments. Until more philosophers take the problem seriously, and recognize the conclusions to which it forces them, this aspect of debate about the metaphysics of time and the origins of the universe—let alone the debate it generates between theists and atheists—is destined not to take its rightful center stage in philosophical cosmology and theology.

The cause of the "Big Bang"

Let us now move on to the second aspect of the KCA to be considered here, namely propositions (C1) to (C3), what I have called the master argument of the KCA. It is in

this area of the debate that physics figures almost as prominently as metaphysics; indeed some critics seem prepared to let physics dictate their metaphysics for them.[43] Whatever the supposed Quinean attractions of doing so, however, it reverses the true order of philosophical explanation. Metaphysics is not a mere epiphenomenon of physical theory: on the contrary, it is the base upon which any adequate physical theory must build. If a physical theory implies or is otherwise committed to metaphysical theses which are absurd, illogical, or repugnant to common sense, then that theory will find itself standing on foundations of sand. Given this, we must examine some of the ways in which current physical cosmology has been applied to the debate over (C1)-(C3). In the following discussion I *assume* certain data of current physical cosmology for the purpose of argument, as well as considering various theories of the origin of the universe. This should not, however, be taken to imply that I accept any of the theories or data as demonstrably true. For all we know, the correct data and theory concerning the origin of the universe are markedly different from anything that has yet been proposed. And even the briefest of perusals of the state of contemporary cosmological and cosmogonical debate, with its plethora of competing, often contradictory theories, should suffice to demonstrate that what marks our current understanding of these issues is not so much what we know, as what we do not.

Now, since (C3) follows deductively from (C1) and (C2), it is really these latter which are the focus of interest, and I shall take them in turn. (C1) says that the universe began to exist. It was argued above (Section 2) that this conclusion is not vitiated by the hypothesis of a quiescent universe, on the assumption that the only events in the universe in its quiescent state were "bare" events consisting of mere transitions from one moment to the next. This is not to say that such a hypothesis makes any sense—perhaps one must regard time and change as inseparable—only that it has no force against the argument proving the impossibility of forming an infinite by successive addition. But what if the quiescent universe has no intrinsic temporal metric?[44] The hypothesis, on this interpretation, is that there was a timeless, unchanging, uncaused something into which space, time and events sprang. What is that something? More needs to be said about the characteristics of such a universe for it to be considered a genuine metaphysical possibility. For instance, if it is not itself spatial how could it contain matter, since matter is by definition extended? In which case would it not be the void, or pure nothingness after all? On the other hand, suppose the quiescent universe is a spatially extended region of undifferentiated, unchanging matter. Presumably, it would have to exist at absolute zero. Now, even if this were metaphysically possible, what is more important for present purposes is that it contradicts the almost universally accepted proposition that the temperature of the universe in its early stages was anything but absolute zero, one estimate being 10^{32} degrees Kelvin at 10^{-43} seconds after the "Big Bang."[45] Even more important, however, is that since no matter can exist at absolute zero (according to current theory), a quiescent universe would be *physically impossible.* But then this means the spontaneous occurrence of events must have been literally miraculous—something the theist would be more than happy to concede. Hence the hypothesis of a quiescent universe into which the chain of events sprang has *an* interpretation consistent both with (C)—the proposition that the chain of past

events is finite—and with the negation of (C1)—that the universe began to exist. But even if that interpretation is coherent (which is not obvious), it implies a non-natural, or as the theist would say, *supernatural,* origin of the universe.[46]

Criticism of (C1) has also come from Adolf Grünbaum.[47] He discusses two models of the origin of the universe, arguing that neither of them implies that the universe literally began to exist.[48] On the first model, the singularity t_0 represents the *first state* of the universe, from which the expansion of space-time derived. This model is criticized by Smith on the ground that the singularity would have to possess less than three spatial dimensions (none at all if it were a point), whereas the points of the universe are standardly defined as points in a four-dimensional space-time continuum (the fourth dimension being temporal, which t_0 does possess).[49] But he immediately concedes that Roger Penrose has proposed a definition of the singularity on which it does have three spatial dimensions, thus undercutting his own criticism.[50] For Grünbaum, however, the problem is not the dimensionality of the singularity, but the alleged fact that any inference from its existence to the proposition that the universe began to exist is invalid, relying as it does on the *prior* existence of temporal instants at which the singularity did not exist. For what else could it mean to say that the universe *began* to exist if not that there were moments at which it did not exist, and later moments at which it did? Since there were, *by definition,* no moments of time before t_0, the universe cannot be said to have begun to exist on this model.

This objection, for all its superficial plausibility, misconstrues the claim that the universe began to exist.[51] For the claim that an object x begins to exist at t does not entail that there were temporal instants prior to t at which x did not exist. Suppose, to adapt a thought of Craig's, one were a relationalist about time, and that one accepted the timeless existence of a quiescent universe consisting of static, homogeneous matter. Suppose also that the first cosmological event was the spontaneous emergence of a particle. Since, on a relationalist account, there was no time prior to the emergence, does it follow that the particle did not begin to exist? Why must there have been prior events, and hence prior instants? (The example can be adapted to fit a substantivalist view of time, but it is more graphic on the relationalist theory.) Further, although analogies between past and future can be dangerous, it is useful and not obviously illegitimate to draw one here. Suppose the universe is to end in a Big Crunch involving its collapse back into a singularity at t_n and the disappearance of that singularity, so that time ceased at t_n. Does it follow that whatever cosmological events were occurring up until the Big Crunch did not literally *finish*? Or that the universe itself did not literally come to an end? If not, then why did the universe not literally *begin* at t_0? The definition of a thing's coming into existence must not necessarily refer to the existence of temporal instants prior to its existence. Craig's proposal is to define "x begins to exist" as: "x exists at t and there is no time immediately prior to t at which x exists."[52]

The second cosmogonical model which Grünbaum considers is one in which t_0 is not the first physical state of the universe, but rather a limit beyond which the cosmic time interval cannot go, its being open in the past. There is, he claims, no first state of the universe, since for any state t_i there is another state t_k such that $t_0 < t_k < t_i$, but the

universe is nevertheless finite: "matter has *always* existed, despite the finitude of the age of the universe."[53]

Whatever the mathematical consistency of such a model, however, it is metaphysically and logically dubious. For Grünbaum is asking us to accept what seems like a straight contradiction: matter has always existed, but only for a finitely long time. It is true that on this model the universe does not begin to exist according to Craig's definition given above, but what this suggests is that his definition needs supplementation.[54] Unfortunately, Craig does not offer this in any formal sense; rather, he appeals to the notion of *permanence*: on the second model, the universe has always existed in the sense that for any time at which it exists, there is a prior time at which it exists; but it has not always existed in the sense that it is not permanent—it has existed for a finitely long time.[55] A spatial analogy might help to make this distinction clearer. Suppose we accept, *arguendo,* that a finite Euclidean line consists in reality of an infinity of points, the line being at least dense: for any two points, there is a third between them. Yet the line has a spatial end: an end which, viewed from the other direction, is a beginning. It might be objected that this presupposes the embedding of the line in a larger one-dimensional space, and so involves the very mistake Grünbaum warns against in the temporal case, namely assuming that there are points at which the line (or the universe) does not exist. But it is hard to see why such a presupposition is necessary. In the example of the line, we do not need to think of it as embedded in a larger space. All we need to suppose is that the line *could* have been longer: it might not have begun where it does in fact begin. Similarly, the universe might have been older (or younger) than it in fact is—the limit beyond which it does not go might have been different; and one assumes Grünbaum does not think the age of the universe to be anything other than metaphysically contingent (even if—which is doubtful—it were *physically* necessary). Still, Grünbaum muddies the waters by comparing the universe to a Euclidean line which is spatially *infinite,* saying *"there is no first instant of time at all,* just as there is no leftmost point on an infinite Euclidean line that extends in both directions."[56] How is this supposed to be a fair analogy with a universe that he admits is temporally finite?

Another line of attack against (C1) comes from Stephen Hawking.[57] I do not propose to enter into a detailed examination of Hawking's model of a "beginningless, finite universe" and the arguments accompanying it: the many logical fallacies, philosophical absurdities and even dubious physical concepts inherent in Hawking's thinking have already been skillfully exposed by both Craig and Smith.[58] Rather, I shall concentrate on the rebuttal of Craig's criticisms offered by Graham Oppy.[59]

Note first that, having given a spirited defense of Grünbaum's second cosmogonical model discussed above, in which the universe is temporally finite and yet without a beginning, Oppy goes on at the beginning of his defense of Hawking to concede that Grünbaum's model "does not amount to much in the context of the attempt to produce physically realistic models of the universe which are beginningless and yet finite."[60] He then goes on to defend aspects of Hawking's quantum-gravitational model (QM), in which space-time is a closed, boundaryless surface, without beginning or end. One is Hawking's use of Feynman's sum-over-histories or path integral approach to describing

the development of the wave function. Now Craig objects that a realist interpretation of the path integral method would commit Hawking to the Everett-Wheeler/Many Worlds interpretation, which is perhaps the second most bizarre interpretation of the formalism of QM yet devised:[61] for any quantum mechanical event, the world "splits" into as many worlds as there are possible histories of the particles concerned. Oppy's reply is that, while Hawking's model does require a commitment to the reality, in some sense, of the space over which the particle histories are summed, this does not imply a realistic interpretation of the histories themselves, and hence not of the worlds which the Everett-Wheeler interpretation postulates. It may be, he says, that all Hawking is committed to is "the instantiation of certain kinds of spatial relations."[62] We are not told what these "spatial relations" are, but the main point is that the debate is not what Oppy thinks it is—one between substantivalist and relationalist theories of space-time. It is between a realist and a nonrealist interpretation of those elements of the formalism of QM which describe Hawking's cosmology. Even on a relationalist interpretation of space-time, the relations must be physically instantiated by the presence of certain particles. If so, the question is whether those particles are really present in each incompatible history which the sum-over-histories method posits as objects to be integrated. And if the answer is yes, then even if the classical spaces correlated with those histories, and embedded in a "superspace," are not given a substantival interpretation, the Many Worlds interpretation has to be taken realistically. In short, Oppy appears to have forgotten that a relationalist about space is not *ipso facto* an anti-realist.

Furthermore, Oppy has missed the central thrust of Craig's criticism, which is that Hawking is caught in a dilemma. Either the interpretation of his QM formalism is realistic or it is not. If it is, he is committed to a metaphysically absurd ontology. If it is not, then the very space-time of his cosmology, the space-time which is supposed to be our universe, will not be real. So what point would there be to his model of the universe? One can choose to be an instrumentalist in order to avoid the embarrassing consequences of a realist interpretation of one's formalism; but one cannot then be heard to protest against the inference that one's formalism has no application to reality. It is not clear to what extent Smith is sensitive to this dilemma. Opting for what he calls a "quasi-instrumentalist" interpretation of Hawking's formalism, which involves a commitment only to the reality of our universe, Smith goes on to suggest, quite reasonably, that we need to answer the question: why is it our universe which is real, while the other space-times are but abstract representations of the path integral method? His answer, briefly mentioned, is that we need to invoke the notion of "decoherence" for "selecting" our universe as the real one, and he cites work by J.J. Halliwell.[63] In other words, we need yet more formalism. But by what rights is *this* formalism to be realistically interpreted? Is the "selection" of our universe a mere mathematical device, or is it metaphysically well motivated? To say that its purpose is to make sure that we know which of all possible universes is the real one is not a sound motivation, but smacks of bootstrapping. And by whom is the "selection" made? An omniscient mind outside the universe? Presumably Smith would not countenance that. But there can be no selection without a selector, any more than there can be observation without an

observer. So we are still left in the dark as to why our universe happens to be the real one. And we are none the wiser about how the formalism of quantum cosmology as used by Hawking (and others) is ultimately to be interpreted.

Another of Craig's criticisms is of Hawking's use of "imaginary time" in his sum-over-histories approach, which enables him to postulate a universe without singularities. Craig rightly objects to Hawking's frequent vacillation and verbal trickery over the reality or otherwise of imaginary time. Hawking goes so far as to suggest that imaginary time, so called because of its use of imaginary numbers, might also be imaginary in the more obvious sense of being "just a figment of our imaginations," or "an idea that we invent."[64] If so, then so much for the instrumentalist reading of Hawking's formalism, since it has astounding ontological implications. But on the very same page he asserts that "a scientific theory is just a mathematical model," and that even imaginary time might be nothing more than part of a "useful description" of our observations. Given Hawking's uncertainty about the ontological significance of his own theory, it would be rash for any interpreter to feel confident that he has made sense of it all. And yet Oppy, having agreed that Hawking's own interpretation is "obnoxious," confidently asserts that what he "ought to say is that what we call 'real time' is not a physically fundamental property of the universe; that is from the standpoint of basic physical description, what we call 'real time' has the same status as 'potable water' or 'visible light.'" This is not, adds Oppy, "to impugn the reality of real time—and nor is it to impugn the reality of the singularities in real time—though it will, I think, require the insistence that real time is merely a local feature of the universe."[65] It is not clear, however, what this analogy is supposed to prove. Potable water really *is* a kind of water, and visible light really *is* a kind of light, so presumably ordinary time really *is* a kind of time. But ordinary—or real—time entails the existence of singularities, in which the universe has a beginning. So does the universe really have a beginning? This cannot be, as Oppy insists, merely a "local" matter—it must be a fact about the universe as such. So does the universe both contain and not contain singularities? Presumably it really is expanding—but from what? To compound the confusion, in the next paragraph Oppy reverts to an instrumentalist interpretation, saying that "one might not be a realist about the model and its allegedly problematic features, but then insist that, from this standpoint, there is no good reason to be a realist about the initial singularities in space-time either."[66] With breathtaking speed, then, Oppy moves from not wanting to "impugn the reality of real time" or impugn "the reality of the singularities in real time" to insisting that it is a perfectly acceptable position not to be a realist either about real time or the singularities it entails. A "shotgun" approach such as this might cover the field—but then so does any dialectical stance which embraces both a theory and its negation. I conclude that Hawking's cosmological model is so vague as to its metaphysical implications that virtually any implication one thinks one has uncovered is so objectionable, and that Hawking himself is so unreliable a guide as to what his theory actually entails, that anyone trying to come to grips with difficult matters such as these is best advised to steer clear of it. More generally, I conclude that none of the arguments examined above has succeeded in refuting the proposition that the universe began to exist.

I move now to a consideration of (C2), the proposition that whatever begins to exist has a cause of its existence. It is this claim which has attracted the most controversy, seeming to all critics of the KCA to embody no more than a piece of metaphysical prejudice. And yet Craig considers it to be self-evident, indeed "so intuitively obvious . . . that probably no one in his right mind *really* believes it to be false."[67] He even suggests that it would be unwise to try to prove the principle, "for one ought not to try to prove the obvious via the less obvious."[68]

Nevertheless, Craig does defend the causal principle in a number of places, and his defenses vary. Sometimes he claims it is a well-founded "empirical generalization based on the widest sampling of experience."[69] He later shies away from this approach, recognizing its dubiousness.[70] It should be pointed out, however, that what is dubious about it is not that it involves a fallacy of composition. First, it does not claim an entailment, only that our experience of things in the universe is good *evidence* that the universe itself is caused. Secondly, it is hard to see why it should *not* be good evidence. After all, if we regularly experienced things' popping into existence uncaused—if we really could establish that they were uncaused—this would give us reason to think the universe itself could have come into existence in the same way; so why can we not say that the fact we do not experience such phenomena is reason to think the universe is no different?[71] What makes the empirical approach undesirable is, rather, that it fails to capture the status of necessary truth which defenders of the causal principle usually believe it to have.

Another method of defense which Craig employs is Kantian, arguing that the causal principle is a transcendentally true, synthetic a priori proposition derived from the category of causality.[72] The problem here, of course, is that if one does not accept Kantianism one is not required to accept this defense, and a "pick and mix" approach, taking the most congenial parts of Kant but leaving aside the rest, whatever its feasibility, would be fraught with danger. So I shall not pursue the Kantian line of defense further. Instead, it is the status of the causal principle as a *de re* necessary truth knowable a priori which should be the focus of concern. According to Mackie, the standard test for judgments of possibility, namely conceivability with no appearance of logical inconsistency, gives good reason to suppose that something can come into existence uncaused, and he cites Hume's apparent denial of the causal principle on that ground.[73] Craig, however, disparages such a test, claiming that it amounts to no more than the construction of a mental image of a thing's popping into existence, and the labeling of that image, "Something's Coming into Existence Uncaused." But that tells us nothing about whether such a phenomenon is really possible, either logically or metaphysically.[74] Certainly Mackie and those who take a similar line on possibility are in danger of laying themselves open to the following objection: that it is impossible to tell whether they have conceived of an object's coming into existence without a cause, or whether they have conceived of an object's coming into existence *without at the same time conceiving of its cause*. Only the former conception is relevant, of course, but since there does not look to be any way of telling *which* conception they are having (apart from their own say-so), the thought experiment is for all practical purposes useless.

It is reasonable to sympathize with Craig's view that the causal principle wears its necessity on its sleeve, so that it would be dangerous to try to defend it by appeal to an even more obvious principle or principles; but naturally the critic is unlikely to be impressed. In fact, I think one can base an argument for the principle on the even more basic law of noncontradiction. For what does the critic of the causal principle ask us to believe? We are asked to countenance the possibility of the following situation: the nonexistence of anything *followed by* the existence of something. The words "followed by" are crucial—how are they to be interpreted? What they cannot mean is that there is at one time nothing and at a subsequent time something, because the nonexistence of anything is supposed to *include* time: to say that at one time there is nothing whatsoever is self-defeating because it is to say that *there is a time* at which nothing exists—hence something did exist. But it is hard to see how else we are supposed to understand "followed by"; or when the denier of the causal principle says that it is possible for something to come *from* nothing what are we to understand by "from"? Again it cannot have a causal sense because something is supposed to have come into existence *uncaused.* All that appears to be left is a timeless contradiction—the existence of nothing and the existence of something. Perhaps the only other way the denier of the causal principle can describe the situation he envisages is by characterizing the existence of nothing and then something in the following terms (echoing Craig's definition of "*x* begins to exist"): at t_0 there is something, and there is no time prior to t_0 at which there is something. But the problem with this formulation is that whilst it may be a plausible definition of something *physical* beginning to exist where there was nothing *physical* before (whether something physical be an individual within the universe or the universe as a whole), it is not a plausible definition of something's coming into existence where there was once *nothing whatsoever.* For it makes ineliminable reference to the temporal dimension, and as such its statement of the nonexistence of anything is really a statement to the effect that there is no time prior to t_0 at which there is something whose existence is *essentially temporal.* Thus the formulation does not exclude the existence of nontemporal entities, whether they be God, spirits or whatever. Or the denier of the causal principle might insist that anything that can exist must exist in time—but why should we accept that unless we hold a prior metaphysical prejudice against atemporal existence? To be sure there are some who think that God, for example, does not exist outside time—but not even they would say (I presume) that when one formulates the idea that something can come from nothing one must do it in a way that rules out the very possibility that God was an atemporal entity. I conclude, then, that one way of defending the claim that nothing can come from nothing is to appeal to the inherent difficulty of formulating its denial in a way that (*a*) does not presuppose the existence of time where there is supposed to be nothing whatsoever, (*b*) is not tacitly restricted to excluding the existence only of things which exist in time where there is supposed to be nothing whatsoever, and (*c*) does not end up as the statement of a straight contradiction: there is being and there is no being.

From this, says the defender of the proposition that whatever begins to exist has a cause, we must conclude that a *productive principle,* of some sort, is necessary for

being. That productive principle must be causally responsible for everything, including the physical universe *and itself*; but if, as the supporter of the KCA argues, the productive principle is outside the spatiotemporal order, the universe being finite, to say that the productive principle causes itself amounts to saying that it is the sufficient reason for its own existence.

There is another argument for the causal principle, which Craig only briefly mentions.[75] It is due to Jonathan Edwards, and since it is intriguing it is worth consideration. If, argues Edwards, the causal principle were false, it would be inexplicable why anything and everything does not come into existence uncaused. Why would some things and not others? It is no use saying that the nature or essence of some things (such as the universe itself) is to begin to exist uncaused, and of others not to, since before anything begins to exist how can the essence of a thing regulate the conditions under which *it* begins to exist? But since we *know* some things begin to exist only if caused, the causal principle cannot be false since its falsity would not allow of such a distinction. Note that Edwards's argument is formulated in such a way that a Platonist theory of essence makes no difference to its soundness: if *nothing* exists, then Platonic essences do not exist either, so they cannot be said to regulate the conditions under which some things come into existence uncaused and not others.

An objection to this argument is offered by Oppy,[76] who claims first that two arguments are being conflated: one to the effect that denying the causal principle makes it inexplicable why anything and everything does not come into existence uncaused, and one such that it becomes inexplicable why anything and everything *cannot* come into existence uncaused. The first, he says, is uninteresting because the explanation of why some things do not come into existence uncaused, such as children, is that they are brought into existence by pre-existing things, such as parents. But this misses the force of the argument altogether. The point Edwards is making is that if it is inexplicable why anything and everything *cannot* begin to exist uncaused, it becomes *ipso facto* inexplicable why anything and everything *does* not. If children *can* begin to exist without parents or any other physical cause, why *aren't* children popping into existence uncaused all over the place? In the case of ordinary possibility and actuality, we have *explanations* of why certain things are not actualized. Why isn't there a fat man in my doorway? Because there are no fat men in the vicinity, and if there were they would have no reason to go near my house, and so on *ad nauseam*. But Edwards's point is that if we deny the causal principle there *can* be no explanation of why, for example, children need parents in order to exist. But since children do exist—the universe does not exclude them for some other reason—why *don't* they begin to exist uncaused? In any case, Oppy goes on to offer his own explanation of why anything and everything *cannot* begin to exist uncaused, namely because there are conservation laws which explain why things in the universe require a cause of their existence.

Clearly this begs the question. On a regularity view of laws it is just a general description of what happens, not an explanation. On a necessitarian view of laws, it still does not explain why things require a cause of their existence, since the necessity inherent in the law *derives* from the powers of existing things, and so appeal to the law merely invokes their existence rather than explains it. Why should the laws be as

they are? Because of the powers of existing things. But why can't those things come into existence uncaused? Because that's how the laws are. One cannot appeal to laws of nature to explain the existence of nature, or of things in nature.[77]

Having considered reasons of pure logic and metaphysics for the principle that nothing can begin to exist uncaused, let us now look at whether physical cosmology can refute it by providing at least a coherent, even if not demonstrably true, model of the uncaused origin either of the universe or of something within the universe. First, a generalized appeal to Heisenberg's Uncertainty Principle will not do, because it primarily governs the change of condition of pre-existing particles (in particular their position or momentum), not their spontaneous coming into existence. But Smith, among others, appeals to vacuum fluctuations which are also alleged to be governed by uncertainty relations, so that particles can spontaneously come into existence.[78] As Craig points out, however, this appeal will not do either, since the quantum mechanical vacuum is not literally nothing, but "a sea of continually forming and dissolving particles which borrow energy from the vacuum for their brief existence";[79] and as Paul Davies says, physicists call it a "false" vacuum.[80] In the case of Hawking radiation, for instance, an escaping particle takes energy from a black hole, and if the black hole does not regain the same amount of energy by swallowing other particles in its vicinity, its temperature increases. Clearly, then, the energy acts as a material cause of the emergence of a virtual particle, even if our predictions of the particle's emergence can never be more than probabilistic. (Oppy seems to think that virtual particle formation in a quantum vacuum is in a different position from other vacuum fluctuations involving the creation of subatomic particles, and hence lends more support to the denial of the causal principle.[81] But why should he think this, if it is the very nature of the vacuum *itself* which belies the claim that particles come into existence *ex nihilo*?).

Another kind of theory which critics of the causal principle sometimes invoke is the quantum tunneling model of Vilenkin, according to which the universe, space-time included, is supposed to have emerged without a cause "from literally *nothing*."[82] Again, however, Craig points out the danger in supposing that what Vilenkin means by "literally nothing" really *is* literally nothing. Rather, he seems to be referring to a "space-time foam" from which real space-time emerges,[83] or some other matrix akin to the false vacuum of quantum mechanics. In any case, since quantum tunneling is standardly used to describe the motion of a particle such as an electron through a barrier despite its lacking the energy to do so, for quantum tunneling to occur, it appears, something must exist to *do* the tunneling. There may well be a consistent mathematical model according to which space-time *itself* emerges from something-we-know-not-what, but it is a conceptual truth—as certain as the truth that there is no wave without a medium of propagation—that in the quantum-cosmological case something must exist in order for tunneling to take place just as in the case of a single particle, whether it be some primordial precursor of space-time or simply an unknowable something. Quantum theory is, then, an extreme example of the way in which modern physical cosmologists, in particular quantum cosmologists, have become so enamored of mathematical models that they have lost sight of, and even interest in, the metaphysical implications of those models.[84] Not only is there nothing

like a semblance of agreement over which of the many competing models is correct, but there is no consensus over what the correct *interpretation* of any of them should be. On the other hand we are faced with a principle, that nothing can begin to exist without a cause of its existence, which is demonstrably true and commends itself to common sense. Given the alternatives, the correct choice should be obvious.

What of the inherently statistical nature of quantum cosmology? Does this mean that quantum events are uncaused? If an efficient cause gives its effect a probability of one, it may be that quantum events do not have efficient causes. But there is far more to be said. Human agents are efficient causes of their actions, and yet their actions rarely if ever have a probability of one. If I raise my hand within the next five minutes, I will have been the efficient cause of my hand's going up, in the sense that I will have *produced* or *brought about* this event. And yet do we want to say that the probability of my hand's going up in the next five minutes has a value of one? Of course not, since whether I *decide* to raise it is a matter of uncertainty. Thus the potential raising of my hand *inherits* the uncertainty of my decision. Similarly, the emission of a photon after particle decay inherits its uncertainty from the uncertainty of the decay. Still, the decaying particle causes, in the sense of bringing about, the emergence of the photon.[85] (It is no accident that quite a few philosophers impressed by quantum theory—and vice versa—would like to explain the freedom of the will in terms of quantum events in the brain.) So it is by no means clear that efficient causation is precluded at the quantum level—any more than material causation, as argued above in reference to the quantum vacuum. It might also be the case that the "sea of virtual particles" in a quantum mechanical "vacuum" gives rise to, or brings about, other particles and structures constituting the early universe, even though the emergence of those structures is inherently a statistical matter. But the theist is not going to balk at the notion that the creation or development of the universe is inherently a statistical matter, given that he also believes the universe to have been created and to be kept in existence by the free and unconditioned decision of God.

On the other hand, it is not necessarily the case that the quantum events of the early universe, any more than other quantum events, *are* inherently statistical. The limitations imposed by Heisenberg uncertainty may well be only epistemic, as evidenced by the fact that there are consistent interpretations which explain apparent indeterminacy and fit observation, such as hidden variable theories, among others.[86] Even if the hidden variables remained hidden in principle, to reject such models would, as Craig argues, be to insist upon verificationism, an approach we have good reason to reject in science as in semantics, epistemology and other areas. These and the above considerations show how much caution is required when it comes to quantum cosmology. It is difficult enough to understand what is supposed to happen at the quantum level in any situation, let alone the unique circumstances of the early stages of the universe. Quantum theory, at the level of interpretation, is poorly understood, riven with claims that are dubious at best and absurd at worst, and is a veritable playground of ill-informed ontologizing of the worst kind. No wonder that the philosopher of science Craig Dilworth has lamented: "the 'theory' [*sic*] itself is inadequate in a certain respect; and . . . due to the fundamental nature of the theory,

the inability of physicists to overcome this inadequacy during the more than fifty years since the theory's inception constitutes an impasse for the development of the central discipline of modern science."[87, 88]

Notes

1 Craig's original study is *The Kalām Cosmological Argument* (London: Macmillan, 1979). Since then, he has produced a stream of papers that is too long to list here. Fortunately, the most important have been collected into the book he has co-authored with Quentin Smith, entitled *Theism, Atheism and Big Bang Cosmology* (Oxford: Clarendon Press, 1993) (hereafter *TABBC*). See further the references in that volume, which give the relevant papers by Craig and Smith as well as numerous other citations of articles on the KCA.

2 As the following discussion suggests, the opposite may well be true, namely that the KCA implies that the A-theory of time must be true; this is something Craig himself appears to believe more strongly than he used to (recent correspondence, and see "Prof. Grünbaum on the 'Normalcy of Nothingness' in the Leibnizian and *Kalam* Cosmological Arguments," *British Journal for the Philosophy of Science* 52 (2001): 1-16).

3 This interpretation of the KCA would appear to be broader than Craig himself would allow, because he maintains that the KCA does not logically exclude the existence of an eternal, quiescent universe. Thus he would not count the argument as applying to what might be called "bare" events involving no more than the effluxion of time, on the assumption that time would pass in such a universe. It is, however, hard to see why this restriction is necessary, and Craig says nothing in defense of it. Still, the exact nature of Craig's interpretation depends on what is meant by "quiescent universe": if, in such a universe, time did not pass, the present interpretation of the KCA would be equivalent to Craig's. See further the section on the cause of the Big Bang below.

4 This is one reason why Stewart Goetz's criticism of the KCA misses the point if his conception of a quiescent universe involves assigning it an intrinsic temporal metric, a matter he does not directly address: see his "Craig's *Kalam* Cosmological Argument," *Faith and Philosophy* 6 (1989): 99-102. It seems that Craig agrees with this, though he does not make much of it: Craig, "The *Kalam* Cosmological Argument and the Hypothesis of a Quiescent Universe," *Faith and Philosophy* 8 (1991): 104-8. On the hypothesis of a quiescent universe as I have interpreted it one would be committed to substantivalism about time. Events, defined as changes in an object or objects, would then include the temporal transitions making up the effluxion of time itself since this would be understood as involving substantial changes in temporal instants and intervals.

5 In fact, the present writer does not believe that there are actual infinities.

6 *TABBC,* 12-15.

7 Craig, "Professor Mackie and the *Kalam* Cosmological Argument," *Religious Studies* 20 (1984): 367-75, at 367.

8 In particular, the claim that the past series of events, if infinite, would be actual rather than potential. Nevertheless, St. Thomas does espouse two of the KCA's principal theses, namely that there are no actual infinities and that the infinite cannot be traversed. See further *Summa Theologica* I, q.7, a.4.

9 Anthony Kenny suggests that the first two Ways are but distinct aspects of a general underlying argument against an infinite regress of causes. See *The Five Ways* (London: Routledge and Kegan Paul, 1969), 36.

10 Mackie, *The Miracle of Theism* (Oxford: Clarendon Press, 1982), 93; Craig, "Professor Mackie and the *Kalam* Cosmological Argument," 368-9. Nevertheless, Mackie wrongly accuses supporters of the KCA of assuming that there is an infinitely distant starting point in the regress of past events.

11 Where "motion" is understood materially. The succession of temporal intervals is perhaps, in a wider sense, a kind of motion.

12 See *TABBC,* 33-5, 85-8, 99-106; Smith, "Reply to Craig: The Possible Infinitude of the Past," *International Philosophical Quarterly* 33 (1993): 109-15, at 113-14; Craig, "Reply to Smith: On the Finitude of the Past," *International Philosophical Quarterly* 33 (1993): 225-31. Apart from Smith, critics of Craig's use of the paradox include: David A. Conway, "'It Would Have Happened Already': On One Argument for a First Cause," *Analysis* 44 (1984): 159-66; Robin Small, "Tristram Shandy's Last Page," *British Journal for the Philosophy of Science* 37 (1986): 213-16; Ellery Eells, "Quentin Smith on Infinity and the Past," *Philosophy of Science* 55 (1988): 453-5. Implicit support for Craig comes from G.J. Whitrow, "On the Impossibility of an Infinite Past," *British Journal for the Philosophy of Science* 29 (1978): 39-45, at 42-3.

13 Russell, *The Principles of Mathematics,* 2nd ed. (London: Allen and Unwin, 1937), 358.

14 More precisely, since it is every *full* day which generates a year's work, and since the day on which we see him writing may not be complete, it is equally certain that he could not have recorded *yesterday's* events: see Small, "Tristram Shandy's Last Page," 214. The distinction dissolves, however, if we imagine that we see Shandy finish writing at exactly midnight.

15 *TABBC,* 33. Cantor's principle states that sets whose members can be one-one correlated are of equal cardinality. Craig's point is that if such a correlation can be made between years and days in the Shandy case, it seems he could complete the task in an infinite time. But since he cannot, there is something wrong about applying the Principle of Correspondence to concrete situations.

16 Small, "Tristram Shandy's Last Page," 214-15.

17 For leap years!

18 *TABBC,* 102.

19 "Quentin Smith on Infinity and the Past," (note 12 above).

20 *TABBC,* 103.

21 "Tristram Shandy's Last Page," 215.

22 Note that we do not need to suppose that in TSP_f the first day of the model, i.e., the first day recorded, is the first of Shandy's life. Certainly we could make outlandish but not inconceivable assumptions about his being born into full maturity with a pen in his hand, ready to record the day of his birth, and so on—but all we need suppose is that there is some day in his life such that he begins his life story with that day, he does so on the immediately succeeding day, and he does not record any of his life before that day. Similarly, in TSP_b we do not have to suppose Shandy plans every day of his life, and hence that he drops dead on the day we find him, only that there is some day in his life such that he has planned every day before and including that one, it taking him a year to plan each day.

23 *TABBC,* 34.

24 *TABBC,* 88.

25 "Tristram Shandy's Last Page," 216.
26 *TABBC,* 87-8.
27 Ibid.
28 Nor does Smith's objection hang on the Principle of Correspondence. Craig claims (wrongly, as we saw) that the years of writing and the days written about can be correlated. Smith, however, is talking about the days written about and the days lived, and his explicit analogy with the sets of natural and of even numbers implies he believes there is also a correspondence between these sets of days.
29 The retraction, important though it is, is buried in note 21 of his essay on "Big Bang" cosmology, not in any discussion of traversal of the infinite: *TABBC,* 209. Smith credits Ellery Eells, who does in fact criticize Smith's objection, but neither Eells's criticism nor Smith's retraction contains much detail.
30 "'It Would Have Happened Already': On One Argument for a First Cause," (note 12 above).
31 Conway, 165.
32 Conway, 165-6 (emphasis added).
33 See Jonathan Bennett, "The Age and Size of the World," *Synthese* 23 (1971): 127-46, at 135, reporting a remark to him by Elizabeth Anscombe. The story is quoted in A.W. Moore, *The Infinite* (London: Routledge, 1990), 44. In *Philosophical Remarks* (Oxford: Blackwell, 1975), 166, Wittgenstein speaks of a person's having purportedly written down the last digit of π, after an eternity of writing (the reverse of the first story), and takes this to be "utter nonsense, and a *reductio ad absurdum* of the concept of an infinite *totality*."
34 The relevant passage from Craig is quoted by Conway, 162, citing Craig, *The Existence of God and the Beginning of the Universe* (San Bernardino: Here's Life, 1979), 48.
35 Whitrow, *The Natural Philosophy of Time,* 2nd ed. (Oxford: Clarendon Press, 1980), 28-32. See also "On the Impossibility of an Infinite Past," cited above (note 12), and "Critical Notice of Craig: *The Kalam Cosmological Argument,*" *British Journal for the Philosophy of Science* 31 (1980): 408-11, at 409.
36 As should be apparent, nothing hinges on the final utterance's producing the present. Suppose it produces some arbitrary prior state S_i, which state is invested by our hypothetical creator with the causal power of producing all subsequent states up to and including the present, without the need for the utterance of any more negative numbers. The question would still be, how the universe reached state S_i.
37 Of course there are theists who take divine eternity to be a kind of sempiternality rather than timelessness, but the following remarks suggest that this interpretation is of no avail either.
38 *TABBC,* 89-91.
39 See, e.g., *Nicomachean Ethics* 1152b28-1153a15.
40 Mackie, *The Miracle of Theism,* 93; Oppy, "Craig, Mackie, and the *Kalam* Cosmological Argument," *Religious Studies* 27 (1991): 189-97, at 195.
41 For Craig's unanswerable reply to Oppy, see his "Graham Oppy on the *Kalam* Cosmological Argument," *Sophia* 32 (1993): 1-11.
42 Hospers, *An Introduction to Philosophical Analysis,* 2nd ed. (London: Routledge and Kegan Paul, 1967), 434; quoted by Craig in *TABBC,* 34-5.
43 Oppy is an egregious example of this tendency. See his "Craig, Mackie, and the *Kalam* Cosmological Argument" (note 40 above), and "Professor William Craig's Criticisms of Critiques of *Kalam* Cosmological Arguments by Paul Davies, Stephen Hawking, and Adolf Grünbaum," *Faith and Philosophy* 12 (1995): 237-50.

44 See further note 4 above.
45 See Steven Weinberg, *The First Three Minutes* (New York: Basic Books, 1988), 146.
46 See further the papers by Goetz and Craig cited in note 4 above.
47 See his "The Pseudo-Problem of Creation in Physical Cosmology," *Philosophy of Science* 56 (1989): 373-94, reprinted in *Physical Cosmology and Philosophy,* ed. J. Leslie (New York: Macmillan, 1990), 92-112; and "Creation as a Pseudo-Explanation in Current Physical Cosmology," *Erkenntnis* 35 (1991): 233-54. These two papers overlap substantially.
48 The following critique of Grünbaum's two models is expanded in my papers, "Adolf Grünbaum and the Beginning of the Universe," *Philosophia Naturalis* 36 (1999): 187-94, and "The Beginning of Existence," *International Philosophical Quarterly* 43 (2003): 145–57.
49 *TABBC,* 116.
50 Ibid., note 13.
51 See the response of Craig: "The Origin and Creation of the Universe: A Reply to Adolf Grünbaum," *British Journal for the Philosophy of Science* 43 (1992): 233-40, at 237-9.
52 Ibid., 238. Craig adds a modification to the definition to exclude the implication that if an eternal (in the sense of timelessly existing) God entered time at the moment of creation, He would by definition have begun to exist. Perhaps this is necessary, but it does not obviously follow from God's *entering* time that He *exists* at the time He enters. Craig's definition is implicitly conceded by Oppy to refute Grünbaum's objection, since he cites it only to turn his attention immediately to (C2): "Professor William Craig's Criticisms," 238.
53 "Creation as a Pseudo-Explanation," 242.
54 In "Adolf Grünbaum and the Beginning of the Universe," 190, I make a formal proposal (B2) which is in fact inadequate. I am grateful to William Lane Craig for pointing this out to me, and propose a better formulation in my "On the Beginning of Existence."
55 "The Origin and Creation of the Universe," 239. Unfortunately Craig lapses back into the language that he initially criticizes, saying that the universe, on this model, "has 'always' existed in the sense that there is no past moment of physical time at which it did not exist." This is to appeal to the definition of "*x* begins to exist" which he rightly rejects; hence I have reworded his point to accord with his own, more accurate definition cited earlier.
56 "Creation as a Pseudo-Explanation," 242 (emphasis in original).
57 Hawking, *A Brief History of Time* (New York: Bantam Books, 1988).
58 Craig, "'What Place, then, for a Creator?': Hawking on God and Creation," *TABBC,* 279-300; Smith, "The Wave Function of a Godless Universe," *TABBC,* 301-37. Smith, however, tries to salvage something from the wreckage, though he notes in passing that one of Hawking's arguments for atheism is "probably the worst atheistic argument in the history of Western thought" (*TABBC,* 322).
59 "Professor William Craig's Criticisms," 242-5.
60 "Professor William Craig's Criticisms," 243.
61 The most bizarre being the so-called Many Minds interpretation, the details of which need not detain us.
62 "Professor William Craig's Criticisms," 243.
63 *TABBC,* 309.
64 *A Brief History of Time,* 139.
65 "Professor William Craig's Criticisms," 244.

66 Ibid.
67 *TABBC,* 57.
68 "Professor Mackie and the *Kalam* Cosmological Argument," 371.
69 *TABBC,* 60.
70 *TABBC,* 147 note 13.
71 Even Mackie himself thinks confirmation of the causal principle in experience lends it some plausibility, though he of course denies its necessity: *The Miracle of Theism,* 89.
72 *TABBC,* 61-3.
73 *The Miracle of Theism,* 89. In fact, there is good reason to think, *contra* Mackie, that Hume himself believed in the causal principle, as Craig shows: "Professor Mackie and the *Kalam* Cosmological Argument," 372.
74 *TABBC,* 371, citing in defense Anscombe's paper, "'Whatever Has a Beginning of Existence Must Have a Cause': Hume's Argument Exposed," *Analysis* 34 (1974): 145-51, esp. 150.
75 "Professor Mackie," 371 note 3.
76 "Craig, Mackie, and the *Kalam* Cosmological Argument," 196.
77 See a similar response by Craig in "Graham Oppy on the *Kalam* Cosmological Argument," 6-7.
78 *TABBC,* 122-3.
79 *TABBC,* 143, and the citation of Barrow and Tipler therein.
80 Davies, "What Caused the Big Bang?" in *Physical Cosmology and Philosophy,* ed. J. Leslie (New York: Macmillan, 1990), 220-38, at 228; originally published in Davies, *Superforce* (New York: Simon and Schuster, 1984), chapter 12. See also Leslie, *Universes* (London: Routledge, 1989), 73.
81 "Professor William Craig's Criticisms," 240-1.
82 *TABBC,* 127-8, 149-50, 155-6, 301-2.
83 See also Leslie, *Universes,* 80.
84 Chris Isham has gone so far as to say (in conversation) that philosophers get far too worried about the metaphysical implications of current cosmological models, because most of the models are mere mathematical devices with no *intended* application to reality! Be that as it may, as long as physicists even give the appearance of seeking to describe the universe as *it actually began,* philosophers have a bounden duty to keep watch over their metaphysical extravagances and absurdities.
85 Davies, "What Caused the Big Bang?" 236.
86 Craig, *TABBC,* 145, and "'What Place, then for a Creator?': Hawking on God and Creation," 481.
87 Craig Dilworth, *The Metaphysics of Science* (Dordrecht: Kluwer, 1996), 190.
88 A remote ancestor of this paper was read at King's College, London in November, 1996; I am grateful for the comments received there.

13

The Tristram Shandy Paradox: A Response to David S. Oderberg

Graham Oppy

In "Traversal of the Infinite, the 'Big Bang,' and the *Kalam* Cosmological Argument," David Oderberg argues that William Craig has the better of his opponents in two important parts of the contemporary discussion of the *kalām* cosmological argument.[1] First, Oderberg defends the claim that "Craig is . . . quite correct to argue that [the Tristram Shandy paradox] supports his contention that the infinite cannot be traversed" (317). Second, Oderberg argues that Craig is correct to defend the two key premises in the *kalām* cosmological argument—namely the claim that the universe began to exist, and the claim that whatever begins to exist has a cause of its existence; that most of what Craig says in defense of these premises is correct; and that Craig's opponents have no decent objections to lodge against these premises. In this paper, I propose to examine Oderberg's discussion of the Tristram Shandy paradox; investigation of what I take to be the many flaws in the second half of his paper will need to be postponed to some other occasion. I shall argue that Oderberg fails to provide any good reasons for thinking that the Tristram Shandy paradox *supports* the contention that no actually infinite collection can be formed by successive addition.

1

The *kalām* cosmological argument to which Oderberg (and Craig) suppose that the Tristram Shandy paradox is relevant runs as follows:

(1) A collection formed by successive addition cannot be actually infinite. (Premise)
(2) The temporal series of past events is a collection formed by successive addition. (Premise)
(3) (Hence) The temporal series of past events cannot be actually infinite. (From 1, 2)
(4) (Hence) The temporal series of past events isn't actually infinite. (From 3)
(5) (Hence) The universe began to exist. (From 4)
(6) Whatever begins to exist has a cause of its existence. (Premise)

(7) (Hence) The universe has a cause of its existence. (From 5, 6)
(8) (Hence) God exists. (From 7)

There are many different criticisms that can be made of this argument. However, as foreshadowed above, in the present discussion, I shall just concentrate on (1); and, in particular, I shall concentrate on the claim—which both Oderberg and Craig defend—that the Tristram Shandy paradox somehow supports the contention that a collection formed by successive addition cannot be actually infinite.

Oderberg explains that (1) amounts to the claim that an actual infinity "has to be given all at once or not at all, and by 'all at once' is meant 'simultaneously.' To take the case of an infinite library . . . if such a thing were to exist, all of its books would have to come into existence at precisely the same time" (307). This explanation seems flawed: surely the most that could sensibly be required in the case of an infinite library is that *some* infinite sub-part of the library is "given all at once." Even with this adjustment in hand, one might well feel that one's grasp of the meaning of (1) is shaky; however, I shall simply assume that it is well enough understood for the purposes of the present paper.

2

There are a number of different "paradoxes" which have been referred to as the Tristram Shandy paradox. I shall list—and label—the different versions that are mentioned in Oderberg's discussion.

First, there is TSP_1, the "puzzle" which is propounded and answered by Bertrand Russell.[2] Suppose that it takes Tristram Shandy one year to record one day of his life. Does it follow that there are days in his life that are never recorded? Not at all, says Russell. If Tristram Shandy lives forever, and if he does not weary of his task, then no part of his diary remains forever unwritten (or, at any rate, it *need not* be that any part of his diary remains forever unwritten).

Second, there is TSP_2, a "puzzle" that is discussed by William Craig in his initial writings on the Tristram Shandy paradox. Suppose that it takes Tristram Shandy one year to record one day of his life. Does it follow that Tristram Shandy is unable to *complete* the task of recording his life?

Third, there is TSP_3, a further "puzzle" that is discussed by William Craig in his initial writings on the Tristram Shandy paradox. Suppose that Tristram Shandy has been writing "from eternity past," and that it takes him one year to record one day of his life. Does it follow that Tristram Shandy is able to complete the task of recording his life?

Fourth, there is TSP_4, a "puzzle" that was first considered by Ellery Eells.[3] Suppose that Tristram Shandy has been writing "from eternity past," and that it takes him one year to record one day of his life. Suppose, further, that Tristram Shandy is able to record his future. Does it follow that Tristram Shandy is able to complete the task of recording his life?

Fifth, there is TSP_5, a "puzzle" that was first considered by Robin Small. Suppose that Tristram Shandy has been writing "from eternity past." Suppose further that it takes him one year to plan one future day of his life. Does it follow that Tristram Shandy cannot now lay down his pen, having completed his planning for today, and with no days in his life prior to now having been left unplanned?

3

I find Oderberg's discussion of TSP_1 odd. What Oderberg criticizes is Russell's apparently careless description of the situation developed in TSP_1 as one in which Tristram Shandy "finishes"—or "completes"—his recording of his life. As Oderberg points out, in the situation described in TSP_1, it is not true that Tristram Shandy "finishes" or "completes" his recording of his life, *if* by this one means that there is a point at which Tristram Shandy lays down his pen, with no prior part of his life unreported. The whole point of the scenario which is described is that Tristram Shandy goes on writing forever: this is what explains how it is possible that there is no day in Tristram Shandy's life which remains forever unrecorded.

However, Oderberg—following Craig—claims that "this part of the KCA assumes the possibility of an actual infinity, and questions whether it could be formed by successive addition. So, let us assume that the future is an actual infinity" (310). But, if the future is an actual infinity, and if—as Oderberg and Craig assume—any temporal series of events is formed by successive addition, then it follows immediately that there is an actual infinity that is formed by successive addition! And if—as Oderberg here allows—it is conceded that it is *possible* that the future is an actual infinity, and if—as Oderberg and Craig assume—it is *necessarily* true that any temporal series of events is formed by successive addition—then it follows that it is *possible* that there is an actual infinity that is formed by successive addition. So, while Oderberg and Craig *may* be right to criticize Russell for his apparently careless claim about Tristram Shandy's "finishing" or "completing" his writing, it seems that—by their own lights—the envisaged scenario does indeed involve a logically consistent description of an actual infinity formed by successive addition, *provided only* that it is logically possible that there is an actual infinity, and that it is logically possible that the future is an infinity of this kind. In the light of this observation, there is clearly room for scepticism about the claim that Craig's criticisms of the thesis that it possible that there is an actual infinity formed by successive addition are independent of his criticisms of the thesis that it is possible that there is an actual infinity.

4

The discussion that Oderberg and Craig give of TSP_2 is also odd. Suppose that we assume that Tristram Shandy can only begin to record a day after that day has

occurred. Then—without making any further assumptions about whether he has been writing for a finite or an infinite amount of time—we can immediately infer that it is not possible for Tristram Shandy to lay down his pen at a time when no part of his life prior to that day remains unrecorded. So this particular version of the story can have *no* bearing at all on the question whether it is possible for an actual infinity to be formed by successive addition.

Consider the following analogy. It is perfectly possible for me to tell an inconsistent story about a ride in a taxi. But my telling such stories provides no evidence at all that it is logically impossible to ride in a taxi. Since TSP_2 would be inconsistent whether or not it involved an actual infinity formed by successive addition, the inconsistency of the version of TSP_2 that involves an actual infinity formed by successive addition provides no support at all for the claim that it is logically impossible for there to be an actual infinity formed by successive addition. Of course, nothing that I have said in this section is inconsistent with the claim that it *is* logically impossible for there to be an actual infinity formed by successive addition; the point is just that it is hopeless to think that TSP_2 might have some role in showing that it *is* logically impossible for there to be an actual infinity formed by successive addition.

5

The oddity that is to be found in the discussion of TSP_2 carries over to the discussion of TSP_3. If we assume that Tristram Shandy can only begin to record a day after that day has occurred, then the addition of the assumption that Tristram Shandy has been writing since eternity past cannot restore consistency to the story. But then—for the reasons already noted—the inconsistency of this version of the story can do nothing to *support* the claim that it is logically impossible for there to be an actual infinity formed by successive addition.

Craig argues that, because the days of Shandy's life and the years in which he records them could be put into a one-to-one correspondence in the case in which he has been writing from eternity past, the story suffices to demonstrate the bankruptcy of the notion that "Cantor's principle" (i.e., the principle that sets whose members can be one-to-one correlated are of equal cardinality) applies to "concrete situations." However, against this, Oderberg argues that, in fact, the years and days "cannot be put into a one-to-one correspondence."

Oderberg's claim seems manifestly false. Here is a correlation: the last day is correlated with the last year; the second last day is correlated with the second last year; the third last day is correlated with the third last year; and so on. This establishes a one-to-one correspondence between years and days. Of course, it is not a one-to-one correspondence between days and years-in-which-Tristram-Shandy-could-have-written-about-the-corresponding-days. But, as we saw above, the assumption that Shandy can only report a day after it takes place all by itself entails that there can be no correspondence of *that* kind.

Craig's argument seems very weak. If there can be actual infinities, then Cantor's principle applies to "concrete situations"; if there cannot be actual infinities, then it does not. But, as we have already noted, the existence of a one-to-one correspondence between the days of Shandy's life and the years in which he records them does *not* guarantee that it is possible for Shandy to finish his writing. So we have been given no reason here to think that the application of Cantor's principle in "concrete situations" is less acceptable than its application in pure mathematics.

6

Oderberg makes two points in his discussion of TSP_4. First, he claims that it is logically impossible for Shandy to record his future. (Oderberg adds: "on the assumption that there is nothing to record until his future is lived" (312). But it is clear that Oderberg thinks that this is an assumption that ought to be endorsed.) Second, he claims that even if it were logically possible for Shandy to record his future, there would still be a logical inconsistency in this version of the story.

Perhaps it *is* logically impossible for Shandy to record his own future. Perhaps it is also logically impossible for anyone else to record Shandy's future. However, rather than explore these suggestions here, I shall simply pass on to the second of the claims that Oderberg makes. (One point that seems worth noting is that, if it is logically impossible for Shandy to record his own future, then it is logically impossible for God to have knowledge of Shandy's future. For, if God could have knowledge of Shandy's future then surely God could pass this information on to Shandy to record. So taking the view that it is logically impossible for Shandy to record his own future has consequences for what one can say about divine omniscience and divine foreknowledge of future contingents.)

Suppose we grant that it is logically possible for Shandy to record his future. What other inconsistency might be detected in TSP_4? Oderberg claims:

> Since . . . there must . . . be a point . . . when Shandy is no longer writing about his future but about his past, it follows that he cannot finish his autobiography because he needs an infinite time to record his infinite past. And this logically contradicts [the claim] that he has finished. But if we suppose him to have finished—by completing the record of his past, having already completed recording his eternal future—then he cannot have had an infinite past, which logically contradicts [the claim] that he has been writing from eternity. (312)

But it simply isn't true that TSP_4 *requires* that there is a point at which Shandy is writing about his past. Suppose that Shandy has lived from eternity past, and that he dies at the precise moment when he lays down his pen. During his last year, he writes about his final day (and, on the final day, completes the description of his death at precisely the time at which he drops dead). In his second last year, he writes about his second

last day. In his third last year, he writes about this third last day. And so on, throughout eternity past. There is no point at which Shandy stops writing about the future; rather, what happens is that his writing ceases as soon as it "catches up" with the present. So there is no inconsistency of the kind that Oderberg here describes in TSP_4. Of course, that's not to say that the scenario is logically possible, even given that it is logically possible for Shandy to record his future; the point is just that Oderberg has produced no argument for supposing that the scenario is logically impossible.

In his discussion of Small,[4] Oderberg makes quite a bit of the claim that TSP_5 is "isomorphic" to an extended variant of TSP_1 in which it is explicitly assumed that Shandy spends his first year of writing recording the first day of his life; the second year of writing recording the second day of his life; the third year of writing recording the third day of his life; and so on. (To make the story simpler, I here assume that the day on which Shandy begins to write is the first day of his life; of course, nothing of any importance turns on this assumption.) But, in fact, the "mirror image" of this extended variant of TSP_1 is precisely the extended variant of TSP_5 introduced above, in which Shandy spends his last year planning his last day; his second last year planning his second last day; and so on. (The "mirror image" of the story in which he lives for a while before he begins to write will be one in which his planning does not end on his final day, but rather on an earlier day.) This should not come as a surprise: for the positive integers provide a natural model for an infinite future series of years, and the negative integers provide a natural model for an infinite past series of years.

7

According to Oderberg, TSP_5 is the version that is most important for discussions of the claim that a collection formed by successive addition cannot be actually infinite. Moreover, Oderberg claims that this version of the story is inconsistent because it requires violation of the principle that every event should have an adequate explanation. In particular, Oderberg follows Craig in asking why it is that, if Shandy has been writing since eternity, he did not finish his planning yesterday, or the day before (since, by those times, an infinite duration would also have elapsed). "[A]t any time, Shandy should have finished, which means that at no time could he have finished, contrary to the assumption . . . that he has finished" (313).

Suppose we stick with the version of the story in which Shandy drops dead at the precise moment at which is planning "catches up to the present." So, Shandy plans his last day during his last year; his second last day during his second last year; his third last day during his third last year; and so on. Given the state of his planning at *any* time, and given that he sticks exactly to his schedule, we can calculate exactly when his planning will "catch up to the present." So, if we are allowed to appeal to the state of his planning at earlier times, then we can give an explanation of why it is that he didn't "finish" yesterday, or the day before, or at any earlier time: for, at *every* earlier time, his planning had not yet "caught up to the present."

Suppose that we add to the story that Shandy drops dead at midnight on December 31, 2001. Why does he "finish" *then*? Clearly, one kind of answer would take the form suggested in the previous paragraph: given his behavior, it was *always* true that he was going to "finish" then (and it was *always* true that he wouldn't finish before then). Since Oderberg doesn't consider this kind of answer to his challenge, it is hard to be certain what his reply would be. However, I suspect that he would say that we have not been given an *adequate* explanation for the fact that it was always true that Shandy was going to "finish" at midnight on December 31, 2001: why *that* time rather than some other time?

Even if Oderberg were right about this lack of adequate explanation—and since he offers no account of "adequate explanation," we have no way of disputing that he would be right—it still would not follow that there is any incoherence in TSP_5. Rather, all that we would be entitled to infer is that the story is *incomplete*. Granted, perhaps, there is something in the story that has not been given an adequate explanation in the story. But, in order to conclude that the story violates Oderberg's favorite principle of sufficient reason, we need the stronger claim that there *could not be* an adequate explanation in an expanded version of the story. (Recall the earlier example of the inconsistent story about a ride in a taxicab. That I can tell you a story about a ride in a taxicab in which there are certain events which are given no adequate explanation in the story provides not the slightest reason to think that the story violates Oderberg's favorite principle of sufficient reason; and still less does it provide reason to think that it is logically impossible to ride in a taxicab.) As things stand, then—even granting the further assumptions about adequate explanation which Oderberg requires—TSP_5 does not provide any support for the claim that a collection formed by successive addition cannot be actually infinite.

Can we expand the story so that it explicitly contains an *adequate* explanation for the fact that it was always true that Shandy was going to "finish" at midnight on December 31, 2001? Here's one line of thought that suggests that perhaps Oderberg ought to be prepared to say that the answer to this question is "Yes!" Suppose that, at all times, God has freely willed that Shandy should "finish" his planning at midnight on December 31, 2001. Given that God is omnipotent and omniscient, and that this is what God has always *freely* willed, surely we do now have an adequate explanation of why it is that Shandy finishes at midnight on December 31, 2001, and not at some other time. Of course, this suggestion relies on the assumption that free will can act as a regress stopper to demands for adequate explanation; but I do not think that Oderberg will be inclined to reject this assumption.

Oderberg does have a brief discussion of the possibility that God could form an actually infinite collection by successive addition. He says: "Craig's critics are unlikely to find much comfort in the thought, if it were true, that the only way the infinite could be traversed were if God did it" (319). However, if it were true that a collection formed by successive addition can be actually infinite if and only if God exists, then it would follow immediately that the *kalām* cosmological argument which we are considering cannot be sound (since it has as a premise the claim that no collection formed by

successive addition can be actually infinite, and yet has as its conclusion the claim that God exists). It is unclear why "Craig's critics" should not find this result congenial.

It is important to be clear about what it is that I think that the argument in the present section establishes. If I am right, then what I have shown is: (1) Oderberg's appeal to his favorite principle of sufficient reason is not sufficient to establish that the situation described in TSP_5 is logically impossible; and (2) Oderberg's discussion of TSP_5 does not issue in any reason at all for supposing that a collection formed by successive addition cannot be actually infinite. I do not claim that anything that I have said establishes that a collection formed by successive addition can be actually infinite; nor do I claim that anything that I have said establishes that the situation described in TSP_5 is logically possible. However, I certainly do claim that, for anything that Oderberg or Craig has argued, it remains a live question whether the situation described in TSP_5 is logically possible.

As it happens, I believe that the scenario described in TSP_5 *is* logically possible. However, I do not think that I have an argument that ought to persuade Oderberg and Craig that this is so. (Perhaps there is a presumption in favor of logical possibility, at least in the case of propositions whose natural expression involves no modal element [i.e., no actuality operators, no necessity operators, no covert references to necessity, and the like]. If so, then failure to find reasons for supposing that a scenario is logically impossible is at least weak evidence in favor of logical possibility. However, it is not clear that very much weight should be given to this kind of argument.) Nonetheless—for the kinds of reasons detailed elsewhere[5]—I take it that the argument of the present paper to this point is enough to establish that, *as things stand,* the *kalām* cosmological argument outlined in Section 1 is a failure.

8

There are other features of Oderberg's discussion of the Tristram Shandy paradox which are both odd and deserving of comment. In the three penultimate sections of this paper, I propose to discuss three of these features.

In his discussion of TSP_5, Oderberg claims to have "demonstrated" that there is a logical inconsistency between (1) the claim that Shandy has been planning since eternity past, and (2) the claim that Shandy's planning has just been completed. Moreover, Oderberg goes on to claim that both of these claims must be made in TSP_5 if it is to have any relevance to the question of whether a collection formed by successive addition can be actually infinite, since the "assumptions are supposed to generate a model which proves that it can" (313).

How does Oderberg argue for a logical inconsistency between (1) and (2)? "[T]he problem is that without a fixed starting point we cannot even say in principle which year corresponds to which day" (312). We have already seen that this argument is a failure: matching the last day to the last year, the second last day to the second last year, the third last day to the third last year, and so on, gives a complete correspondence

between days and years. If there is a logical inconsistency between (1) and (2), that inconsistency cannot be established by the argument that Oderberg gives.

The second plank in this part of Oderberg's discussion fares even worse than the first. As we noted in Section 3, even TSP_1—which does not include claim (2)—is relevant to the question of whether a collection formed by successive addition can be actually infinite. Moreover—and far more importantly—it isn't true that the reason why TSP_5 is supposed to be relevant to the *kalām* cosmological argument is that it is an attempt to generate a model that *proves* that a collection formed by successive addition can be actually infinite. The argument which Oderberg—and Craig—actually defend is something like this:

A. If a collection formed by successive addition can be actually infinite, then the scenario described in TSP_5 is logically possible.
B. The scenario described in TSP_5 is not logically possible.
C. (Hence) A collection formed by successive addition cannot be actually infinite.

Plainly one need not suppose that TSP5 is a model that *proves* that a collection formed by successive addition can be actually infinite in order to suppose that this argument fails.

It is perhaps also worth noting that there may be some inconsistency in the remarks that Oderberg makes about (1) and (2). We have already discussed the part of the paper where Oderberg argues that (1) and (2) are logically inconsistent. But later Oderberg goes on to say that:

> Since (1), in conjunction with (2), violates the Principle of Sufficient Reason, we must take the paradox as not being realizable. . . . There is no internal inconsistency inasmuch as assumptions (1) and (2) of the model are compatible. Together, however, they violate the Principle of Sufficient Reason taken in its least controversial form. Craig is, therefore, quite right to argue that the paradox supports his contention that the infinite cannot be traversed. (316-17)

The apparent inconsistency between the earlier and the later remarks would not be removed even if Oderberg were to think that his Principle of Sufficient Reason is logically necessary. I have been unable to find any other even *prima facie* attractive avenue for restoring consistency to Oderberg's discussion.

9

There are places where it seems to me that Oderberg insists on uncharitable interpretations of the writings of those whom he opposes. We have already seen this in the case of his discussion of Russell's original presentation of TSP_1. I think that it is clear from the context that *either* Russell was merely careless in referring to TSP_1 as a situation in which Shandy "finishes" his autobiography, *or else* Russell was

unduly optimistic in expecting that readers would happily extend the interpretation of "finishing" an autobiography to include all situations in which no part of the autobiography remains forever unwritten. By contrast, Oderberg supposes that Russell is presenting TSP_2, and that his discussion of the case is seriously confused.

In a similar vein, Oderberg's discussion of Smith[6] seems to me to make hash of Smith's views by supposing that claims which Smith clearly intends to apply to TSP_1—and to apply to what he correctly takes to be discussion of TSP_1 in Craig[7]—are instead intended to apply to TSP_5. Since TSP_1 requires the assumption that there is no time at which Shandy finishes, while TSP_5 requires the assumption that there is a time at which Shandy finishes, it is clear that a little misinterpretation here has the potential to go a long way. (This misinterpretation is not justified by the observation that only TSP_5 is really relevant to (1) in the *kalām* cosmological argument, since discussion of the Tristram Shandy paradox can have—and indeed has had—a life of its own. Smith's primary concern—in the paper at issue—is with questions about infinity and the past; whether the answers to these questions have implications for the *kalām* cosmological arguments is not a concern which surfaces anywhere in Smith's 1987 article.)

There is also the matter of Oderberg's discussion of part of my previous work.[8] He writes:

> Oppy goes so far as to say that by the claim that it is impossible to traverse an infinite with no first member, Craig merely means—tautologously—that an infinite with no first member is objectionable because it has no first member. This latter charge is mystifying. It is one thing to argue, as Craig does, that an infinite series cannot be traversed because it has no first member, and another entirely to mean by "It cannot be traversed" that it has no first member. Pigs cannot write poetry because they do not have language; but "Pigs cannot write poetry" does not mean "Pigs do not have language." That they cannot write poetry is a consequence of their not having a language. Similarly, the untraversability of an infinite series with no first member is a consequence of its having no first member, hence it does not follow from the assertion that both obtain that they say the same thing. (319)

Now, in fact, what I wrote was this: "what [Craig] says is that it is a legitimate objection to infinities which have no first member that they cannot be traversed. But what does this mean? Well, as far as I can see, it means that it is a legitimate objection to infinities that have no first member that they have no first member!"[9] And—surprise, surprise!—the parenthetical "tautologously" makes no appearance in what I actually wrote. For, while it is true that what I wrote *could* be read in the way in which Oderberg reads it, that is not the way in which I intended it to be read. Consider the claim that clouding over means rain: following Oderberg, we could insist on taking this claim to express the view that "clouding over" and "rain" have the same meaning. But it is far more likely that we shall understand the claim to be expressing the view that clouding over is a sign of rain, or that clouding over *conveys the information* that it will rain. In a similar fashion, what I wrote was intended to express the view that, in defending his claim that it is impossible to traverse an infinite with no first member, Craig succeeds

in doing no more than *conveying the information* that he finds infinities with no first member objectionable because they have no first member, whether or not he would himself be happy with this description of the result of his actions. (The "because" here is the "because" of mere causation, not the "because" of reasons.)

Perhaps the claim that I intended to express is wrong. Perhaps Oderberg is right when he goes on to say that Craig's reply to me is "unanswerable" (319 n. 41).[10] However, it seems worth pointing out that, whatever good grounds Craig may have been adverting to for denying that there can be an actual infinity formed by successive addition, they receive no mention or discussion in Oderberg's paper. For, on the one hand, the only cogent consideration to which Oderberg appeals is the violation of the principle of sufficient reason in the case of TSP_5. Plainly enough, this consideration has no relevance to TSP_1. And yet, on the other hand, Craig's "unanswerable" reply to me is, essentially, the point that the "traversals" in TSP_5 and TSP_1 are equally unacceptable to Craig, even though TSP_1 has a first member. It *does* seem to me that the appeal to violations of the principle of sufficient reason in this context is rather intimately connected to the absence of first members in the series in question! Nonetheless, rather than press this point, let me end the discussion with a challenge: to my knowledge, no one has ever clearly set out an argument for (1), with clearly identified premises—and clear explanations of the key terms involved—that has even the remotest claim to cogency. If either Craig or Oderberg were to put up here, then almost all other aspects of the discussion would become sideshows.

10

Oderberg begins the final phase of his investigation of the Tristram Shandy paradox with some discussion of Wittgenstein's observation that "if we came across a man saying ['−5, −4, −3, −2, −1, 0—finished'], and were told in response to our question of what he was doing that he had just finished [reciting the series of positive integers backwards] we would find the scenario *inherently preposterous*" (317, my emphasis).

Now, there is an obvious sense in which this is true. For suppose, instead, that you came across an elderly person who said "−5, −4, −3, −2, −1, 0—finished," and that you were told in response to your question that this person has just finished reciting the series of positive integers backwards from one billion. If a person could manage one integer per second for eight hours a day, then that person could count a little over ten million integers per year. Thus, it would take not much short of one hundred years counting at one integer per second for eight hours a day to count backwards from one billion to zero. It is absurd to suppose that any person will ever actually do this (unless people become *very* much longer lived in the future). And yet one billion is such a tiny number!

Setting aside these kinds of considerations, however, it is not at all obvious that there is a further sense in which Wittgenstein's claim is true. Since the person ends their counting "−5, −4, −3, −2, −1, 0—finished," it may be tempting to suppose that the person has set out with the aim of working their way backwards through the

positive integers (i.e., that they began with the thought that they would carry out this task, and then set about carrying it out). But, of course, this way of conceiving of the story is of very dubious intelligibility, since there is no greatest positive integer from which the counting can begin. In order for the story to have a more plausible claim to logical consistency, it must be that the person has *always* been counting, and has *always* been equipped with the desire to say "finished!" and stop counting as soon as zero is reached. (Note that I haven't said outright that the version of the story which is currently under consideration is logically inconsistent. I do not think that "infinity machines" are logically inconsistent; and it is not completely clear that an infinity machine could not carry out the task in question. However, I do not wish to pursue these considerations here.)

Oderberg finds a different kind of difficulty that lies in the fact that the person has "lived from all eternity only to arrive at the present":

> Applying the scenario to the case of the universe considered as a chain of events stretching back into the past, the absurdity is no less apparent. Could the chain be infinite? But then how could the present moment ever arrive? Simply adding moments gets you nowhere, since no amount of additions of moments gets you to a given moment if the addition does not begin at any specific moment. (317)

Here, I'm inclined to repeat my previous response to Craig on what I take to be the same point. *Every* addition of moments begins at a specific moment: this year began at the end of last year; last year began at the end of the year before; and so on. The present moment "arrives" because this year was added to last year; last year was added to the year before; the year before was added to the year before that; and so on. Where is the problem? If there is a problem here, I do not think that Oderberg has made any further progress in the attempt to give a clear account of exactly what it is. When Oderberg cites Hospers's question ("If an infinite series of events has preceded the present moment, how did we get to the present moment? How could we get to the present moment—where we obviously are now—if the present moment was preceded by an infinite series of events?"[11]), I do not see why it *could not be* perfectly adequate to answer with the observation that we got to the present moment from the previous moment; that we got to the previous moment from the moment before that; and so on. If there can be actually infinite collections formed by successive addition, then the answer will be perfectly adequate; if not, not. We are not in the least bit closer to an argument that is capable of decisively resolving the clash of intuitions that arises here.

11

As I mentioned at the beginning of this article, Oderberg claims to vindicate Craig's contention that the Tristram Shandy paradox supports the claim that a collection formed by successive addition cannot be actually infinite. In my view, the preceding discussion shows that this is not so. There is nothing in what either Oderberg or Craig

says which suffices to show that any version of the Tristram Shandy paradox supports the claim that a collection formed by successive addition cannot be actually infinite. If there is support to be found for this premise in the *kalām* cosmological argument, then it seems to me to be more or less certain that it must be found elsewhere.

In conclusion, I shall *tentatively* advance a different argument in support of the conclusion that it is more or less certain that the Tristram Shandy paradox does not provide support for the claim that a collection formed by successive addition cannot be actually infinite. If no collection formed by successive addition can be actually infinite, then any story involving an actually infinite collection formed by successive addition should seem as absurd as any other such story, when considered with respect to this feature alone. (No story which contains an explicit contradiction is more absurd than any other story which contains an explicit contradiction, at least when considered solely with respect to the fact that it contains an explicit contradiction.) But—as Oderberg's own discussion aims to bring out—many people suppose that there is a vast difference between the apparent acceptability of TSP_1 and TSP_5, even though both are stories involving an actual infinity formed by successive addition. In consequence, there is clearly reason to think that, to the extent that there is something especially problematic about TSP_5, this is not the result of the fact that it is a story about an actual infinity formed by successive addition. (If there is something wrong with this line of thought, I can't yet see what it is.)

Notes

1 David Oderberg, "Traversal of the Infinite, the 'Big Bang,' and the *Kalam* Cosmological Argument," *Philosophia Christi* 4 (2002): 303-34 In-text citations refer to this article.
2 Bertrand Russell, *The Principles of Mathematics* (London: Allen and Unwin, 1903).
3 Ellery Eells, "Quentin Smith on Infinity and the Past," *Philosophy of Science* 55 (1988): 453-5.
4 Robin Small, "Tristram Shandy's Last Page," *British Journal for Philosophy of Science* 37 (1986): 213-16.
5 Graham Oppy, "Arguing About the *Kalam* Cosmological Argument," *Philo* 5 (2002:1): 32-59.
6 Quentin Smith, "Infinity and the Past," *Philosophy of Science* 54 (1987): 63-75; reprinted in *Theism, Atheism and Big Bang Cosmology,* ed. William Lane Craig and Quentin Smith (Oxford: Clarendon, 1993), 77-91.
7 William Lane Craig, *The kalām Cosmological Argument* (London: Macmillan, 1979).
8 Graham Oppy, "Craig, Mackie and the *Kalam* Cosmological Argument," *Religious Studies* 27 (1991): 189-97.
9 Ibid., 194.
10 See William Lane Craig, "Graham Oppy on the *Kalam* Cosmological Argument," *Sophia* 32 (1993): 1-11.
11 John Hospers, *An Introduction to Philosophical Analysis,* 2nd ed. (London: Routledge and Kegan Paul, 1967).

14

The Tristram Shandy Paradox: A Reply to Graham Oppy

David S. Oderberg

Graham Oppy accuses me of six cases of "oddity" in my discussion of the Tristram Shandy paradox, and he also makes numerous references to what "seems" to him to be wrong about it. Since I am more interested in reality than in appearance, and in error rather than oddity, I shall confine myself to listing, point by point, all of the mistakes in Oppy's commentary. In fact I can scarcely find one thing he says about my discussion, and about the *kalām* cosmological argument (KCA) in general, that is not wrong or confused.[1]

Section 1

He says, "This explanation seems flawed: surely the most that could sensibly be required of an infinite library is that *some* infinite sub-part of the library is 'given all at once'" (336). I reply: No, my claim is that actually infinite collections must be given all at once—that's all. I have no idea why Oppy prefers to talk about infinite sub-parts, and he does not enlighten us.

Section 2

It is misleading for Oppy to separate the original Tristram Shandy paradox into TSP_1 and TSP_2. True, Russell's discussion might be thought to lend itself to this, but as I remarked, this itself is misleading. There are two aspects that need to be distinguished and understood, but not two paradoxes. The two aspects are illustrated by means of the quantifier shift fallacy I mention in my original paper: that no day is unrecorded does not entail that Shandy can *finish,* as no traversal is possible in the scenario.

Section 3

(*a*) I do not criticize "Russell's apparent carelessness"; I remark upon, and implicitly criticize, his *canniness* (my word in the original paper). I do not think there is anything

careless in his implicit refusal to equate there not being any part of Shandy's diary that remains unwritten with Shandy's *coming to an end*. He knew the difference, I submit, whatever impression he sought to give in his discussion. (*b*) The last paragraph of Section 3 contains a perverse misunderstanding of the dialectic between the supporter of the KCA and the opponent. Neither I nor William Lane Craig assumes that *any* temporal series of events is formed by successive addition, because neither of us believes that an *actually infinite* series of events could be formed by successive addition. Nor do I "concede" that it is possible that the future is an actual infinity—I *assume* it for the purposes of argument! My central argument is that *if* the future were actually infinite, it could *not* be formed by successive addition, since the future is a temporal series of events, and temporal series of events are formed by successive addition;[2] specifically, as far as the present discussion is concerned, that the Tristram Shandy paradox does not illustrate the possibility of such formation. Hence Oppy is wrong to assert that "the envisaged scenario does indeed involve a logically consistent description of an actual infinity formed by successive addition" (338): for the *whole point* of Craig's (and my) criticisms is that such a scenario would *not* be logically consistent, or at least would involve the contravention of a self-evident truth (the Principle of Sufficient Reason, about which more later).

Section 4

As for Oppy's misleading analogy with taxi rides in the second paragraph, my reply is: neither Craig nor I offer the forwards case of TSP as *proof* that the infinite cannot be traversed, only that it is not a scenario which shows it *can*.[3] The fact that TSP_2 "would be inconsistent *whether or not* it involved an actual infinity formed by successive addition" (emphasis added) entails that it would be inconsistent *even if* it involved an actual infinity formed by successive addition; so it cannot be a *case* of an actual infinity formed by successive addition!

Section 5

(*a*) With regard to the first paragraph, I refer the reader to what I have just said. (*b*) In the third paragraph, discussing TSP_2, Oppy says that "the assumption that Shandy can only report a day after it takes place *all by itself* [my emphasis] entails that there can be no correspondence of *that* kind," namely "a one-to-one correspondence between days and years-in-which-Tristram-Shandy-could-have-written-about-the-corresponding-days" (339). This is wrong: in the forwards case too Shandy can only report a day after it takes place but there *is* a one-one correspondence of the kind mentioned. The lack of correspondence in the backwards case is generated by Shandy's *writing from eternity past*. And the inconsistency in both TSP_2 and TSP_3 is generated by Shandy's getting infinitely far behind in his writing.

(*c*) In the fourth paragraph Oppy does say something true but it does not help his case, since he concedes that "the existence of a one-to-one correspondence between the days of Shandy's life and the years in which he records them does *not* guarantee that it is possible for Shandy to finish his writing" (339). Well said; but it is then a non sequitur for him to conclude, "So we have been given no reason here to think that the application of Cantor's principle in 'concrete situations' is less acceptable than its application in pure mathematics" (339). Even if (which I will assume without endorsing) Cantor's Principle is acceptable in pure mathematics, it is less acceptable in concrete situations because it implies that Shandy should be able to finish his autobiography. But, as Oppy acknowledges, he cannot. So this is a *reductio* of Cantor's Principle as applied to a real case. (Maybe it does apply to other real cases, but then there are other arguments against that hypothesis.)

Section 6

(*a*) I confess to being partly responsible for Oppy's parenthetical confusion in paragraph two (340), so I must clarify my position. By claiming that it is logically impossible for Shandy to record his own future, I meant—by a kind of natural knowledge or experience. *This* is what I take to be logically impossible since the future is not real and recordable in the way that the past is. But I would still allow that God may (indeed *does*) have knowledge of the future of a kind which He *could* pass on to Shandy for recording.

(*b*) With respect to paragraph four (341), I emphasize simply that Eells's model is as I describe it in my original paper, and, as Eells acknowledges, on that model Shandy cannot finish his autobiography. I add that this is because it is logically inconsistent, whatever its mathematical consistency. But all Oppy does here is to *change* the scenario by in effect anticipating TSP_5, where each day recorded (planned) occurs *after* it is recorded (planned).

Section 7

(*a*) In paragraphs two and three Oppy pretends to offer an adequate explanation of why Shandy finishes when he does in TSP_5: "Given the state of his planning at *any* time, and given that he sticks exactly to his schedule, we can calculate exactly when his planning will 'catch up to the present'" (341). Since I don't consider this kind of answer to my challenge, adds Oppy, "it is hard to be certain what his reply would be." Well, allow me to provide some certainty: I trust Oppy will not be offended if I decline the offer of his pseudo-explanation. For we can only know the state of Shandy's planning at any time because we *already* know *when* he has finished; so to try to explain why Shandy finishes when he does by appeal to the state of his planning, which we only know because we know when he finishes, would be to offer a paradigmatic example of a circular explanation—which is no explanation at all.

(*b*) I endorse Oppy's claim in paragraph four that TSP_5 is incomplete, but I add that this is precisely because it contains an explanatory hole. I note his passing and grudging "Granted, perhaps, there is something in the story that has not been given an adequate explanation" (342) and remark also that my "favorite" principle of sufficient reason is also the favorite of virtually all philosophers throughout history.

But let that pass. Oppy wants to know whether "there *could not be* an adequate explanation in an expanded version of the story." For "expanded" I think we should read "altered." Oppy offers "one line of thought that *suggests* that *perhaps* Oderberg *ought to be prepared* to say that the answer to this question is 'Yes!'" (342, emphasis added). Oppy's embarrassment of caveats is all too necessary, because the scenario he offers me in paragraph five is one in which "at all times, God has freely willed that Shandy should 'finish' his planning at midnight on December 31, 2001." Forgive my confusion, but I thought I was supposed to be using the Tristram Shandy paradox to defend the *kalām* cosmological argument, and hence the existence of God, and that the argument's critics were trying to do the opposite. Does Oppy now expect me to *assume* the existence of God in my discussion of the paradox? Or worse, does the opponent of the KCA want to make such as assumption? I think not.

(*c*) In the following paragraph Oppy wonders why Craig's critics should not find it congenial that the KCA be shown to be unsound by means of the argument's supporters acknowledging the possibility of God's forming an actually infinite collection by successive addition. The reason the critics should not find it congenial is that it would mean refuting the KCA by assuming the existence of God. If the KCA is unsound because it ignores the possibility that God could traverse the infinite which theist, I wonder, would not cast the KCA aside as the price of dialectical victory over his critics?

(*d*) Paragraph eight of Section 7 does occasion mild amusement, I confess. First Oppy says that he believes the scenario in TSP_5 to be logically possible, but that "I do not think that I have an argument that ought to persuade Oderberg and Craig that this is so" (343). Fair enough. He then offers a sheepish presumption in favor of logical possibility in certain contexts, concluding "it is not clear that very much weight should be given to this kind of argument." Okay, so why mention it? And it is hard to see how he has shown, given all the points I have so far listed (let alone those to come), that "the argument of the present paper to this point is enough to establish that, *as things stand* [whatever that means], the *kalām* cosmological argument outlined in Section 1 is a failure" (343). Maybe the "kinds of reasons detailed elsewhere" will do the trick—like in Oppy's "Arguing About the *Kalam* Cosmological Argument."[4]

Section 8

(*a*) Oppy asserts:

> In his discussion of TSP_5, Oderberg claims to have "demonstrated" that there is a logical inconsistency between (1) the claim that Shandy has been planning since eternity past, and (2) the claim that Shandy's planning has just been completed. Moreover, Oderberg goes on to claim that both of these claims

> must be made in TSP_5 if it is to have any relevance to the question of whether a collection formed by successive addition can be actually infinite, since "the assumptions are supposed to generate a model which proves that it can." (344)

And when trying to explain how I argue for a logical inconsistency in between (1) and (2), he quotes my claim that "without a fixed starting point we cannot even say in principle which year corresponds to which day." Oppy has indeed quoted me correctly; unfortunately the quotations refer to TSP_3 not TSP_5 (i.e., to the scenario in which Shandy has been writing his autobiography from eternity past, with days lived preceding years in which they are recorded—*not* to the scenario in which he plans his life from eternity). So this first part of Oppy's critique in Section 8 is an irrelevant confusion, based as it is on a simple misreading of my paper.

(*b*) What about the second part? Oppy claims that "one need not suppose that TSP_5 is a model that *proves* that a collection formed by successive addition can be actually infinite in order to suppose that this argument fails"—namely, propositions (1)-(3) laid out by him earlier. Well, the critic needs to prove that TSP_5 is not not logically possible (i.e., that it *is* logically possible); or at least he must cast reasonable doubt on the truth of (2) (i.e., doubt that TSP_5 is not logically possible). In other words, the critic must give reasonable grounds for thinking that it *is* logically possible. And Oppy has not even come close.

(*c*) He then tentatively suggests an inconsistency in my own remarks about assumptions (1) and (2), quoting me against myself. It is well that he says "may" and "apparent," because in fact there is no inconsistency. When I argue that the Tristram Shandy paradox presents an inconsistent scenario, I am talking explicitly about TSP_1, TSP_2, TSP_3, and TSP_4—*not* TSP_5. With regard to the fifth version, I say that there is no internal inconsistency and that (1) and (2) are compatible in the way the scenario is described—*but* that the scenario still violates the Principle of Sufficient Reason and hence is, in the broad sense, logically impossible.

Section 9

(*a*) Oppy accuses me of uncharitable interpretations of those whom I oppose. He begins with Russell, accusing me of charging Russell with being "seriously confused." Where he gets that from I do not know, since what I accuse Russell of is not being confused but being *canny* (the word used in my original paper) (i.e., shrewd) in his not explicitly equating TSP_1 and TSP_2 whilst giving the impression to the incautious reader that he is making just such an equation. Perhaps I am reading too much into Russell here; perhaps he is just plain careless or confused. But that's fine—Oppy accuses him of being either careless or "unduly optimistic." So it seems uncharity abounds; or maybe just fair comment.

(*b*) I am next accused of "making a hash" of Quentin Smith's views, but Oppy does not offer specific instances, saying only that I suppose claims Smith intends to apply to TSP_1 are intended to apply to TSP_5. I cannot find where in my original paper I am

guilty of this, so I cannot comment. What I can say is the fact that Smith discusses Tristram Shandy independently of its bearing on the KCA is irrelevant; he discusses it with explicit reference to the question of whether it illustrates the coherence of supposing an actually infinite past, and I attribute no more to Smith than that on the few occasions when I refer to him in the first part of my original paper (on successive addition).

(*c*) I am accused of misinterpreting Oppy himself. In my defense I ask the reader to judge for himself. Read the extract from my original paper quoted by Oppy in Section 9; then read Oppy's own words quoted immediately afterwards. Have I misinterpreted him? A blind man would like to see it. Oppy makes his own backhanded concession that I have at least not put an unreasonable interpretation on his words by saying himself, "while it is true that what I wrote *could* be read in the way in which Oderberg reads it, that is not the way I intended it to be read." Fine, I do not profess to have mind-reading abilities; I took his words at face value. But I now ask the reader to work through the rest of the tortuous paragraph in which Oppy explains his true intent, and then to see if he can make heads or tails out of it. I cannot.

(*d*) "Perhaps the claim I intended to express is wrong. Perhaps Oderberg is right when he goes on to say that Craig's reply to me is 'unanswerable'" (346). I share Oppy's sentiment, painful as it may be for him to acknowledge. But it is true, I do not summarize Craig's paper in my own—it can speak for itself, and the reader is invited to inspect his unanswerable reply. The scope of my original paper is more limited: one thing I do, which Oppy seems to have missed, is to recapitulate Craig's objection to TSP_1 that it is a scenario in which Shandy gets infinitely far behind in his autobiographical labors, and so *ipso facto* cannot finish. Another thing I do, which I take to be more in the way of an original contribution to the debate, is to emphasize the role of the Principle of Sufficient Reason in TSP_5 and related scenarios. It might be the "only cogent consideration to which Oderberg appeals" in discussion of TSP_5 (actually, I do make many other substantive points along the way), but I am glad Oppy finds it cogent as I do: one cogent point can bring down a house full of arguments, at least in my experience of philosophy. Maybe by appealing to PSR I have not grasped what Craig is getting at in his own various discussions of Tristram Shandy: I have not asked him. But I submit that I have captured the essence of at least one principal strand of Craig's multifaceted objections; and anyway the task I set myself was justification, not interpretation.

I do agree, however, with Oppy's remark that "the appeal to violations of the principle of sufficient reason in this context is rather intimately connected to the absence of first members in the series in question!" (347). Why the exclamation mark? The observation is a good one, in fact, and points precisely to why PSR considerations apply to TSP_5. Oppy then challenges the supporter of the KCA to come up with an argument for the premise that a collection formed by successive addition cannot be actually infinite. I offer him the following:

Premise 1. All collections formed by successive addition are traversable.
Premise 2. All actually infinite collections are not traversable.
Conclusion. No collections formed by successive addition are actually infinite.

Oppy rightly requires "clear explanations of the key terms involved." I assume we can agree on what "successive addition" means; but what about "traversable"? This term of art, going back to the medieval exponents of cosmological arguments (e.g., *pertransire* in St. Thomas Aquinas, *Summa Theologica* I, q.46, a.2), requires more explanation than I can give here; all I shall propose is that traversal involves the transfer of information or energy from one member of a collection to another, ending at a point of completion whereby there are no longer any members through which the energy or information is yet to pass. In the case of actually infinite collections (supposing them to be possible for the purpose of argument), traversal is impossible because no matter what part of the collection we fix upon such that information or energy has reached that point, there are always members of the collection beyond that point which have not yet been reached by the same information or energy. If the opponent of this thought protests that at *every* point in the collection energy or information must have reached that point, then my reply is that all this reveals is that the critic simply is not conceiving of the transfer of energy or information as a genuine *transfer,* (i.e., as involving genuine *motion,* where motion is understood broadly, not as confined to material motion—see the third section of my original paper). Instead, he is thinking of a block collection (like the block universe of the B-theorists) in which energy or information is simultaneously present at all members of the infinite series without any packet of energy or information actually having *moved anywhere.* If he wants thereby to deny the reality of movement, let him; but that is a topic for another discussion. For present purposes I am assuming a shared belief in the reality of movement on the part of Oppy and myself.

Section 10

(*a*) In paragraph four of his discussion (and rejection) of Wittgenstein's famous thought about the reverse recitation of an infinite series of numbers, Oppy says: "In order for the story to have a more plausible claim to logical consistency, it must be that the person has *always* been counting, and has *always* been equipped with the desire to say 'finished!' and stop counting as soon as zero is reached" (348). Well? What is his point? Unfortunately he does not elaborate, save for a parenthesis to the effect that *maybe* an "infinity machine" could carry out the task in question. But the reader is none the wiser as to whether Oppy thinks Wittgenstein's scenario, even if it is logically consistent, has anything preposterous or absurd about it, anything which violates some self-evident truth or other, and so on. Wittgenstein thinks it does, and this is one of the rare occasions on which I agree with him. Craig also thinks it does. Does Oppy?

(*b*) The final paragraph of Section 10 contains the usual, well-worn move of the critic of cosmological arguments. The arrival of each separate moment in time (or point of space-time, or each slice of the universe, etc.) is explained by its prior moment (point, slice, etc.) and nothing else is required: "The present moment 'arrives' because this year was added to last year; last year was added to the year before; the year before was added to the year before that; and so on. Where is the problem?" (348). To which

I can only offer the usual, well-worn reply, in the hope that there is more than a mere "clash of intuitions" here: the explanation of each member of the series by appeal to a prior member of the series leaves an explanatory remainder: it does *not* explain how the *entire series* could terminate at a specific moment—say, now—with the state of things as they are *now*. If eternally-existing Jones finishes the backwards recitation of π from eternity on December 24, 2005, do we have an adequate explanation of why he didn't finish on December 23 or 26 (assuming a constant rate of recitation, say one digit per day)? Why not just say that he recited "three" on December 24 because he recited "one" on December 23, and he recited "one" on December 23 because he recited "four" on December 22 . . .? It's the ellipsis that gives the game away. I doubt that anyone thinking clearly about this scenario can honestly believe that I have just given an adequate explanation of why Jones finished *when* he did. Remember, by the way, that we are talking about *efficient* causation, not *final* causation: we are not talking about Jones's *reasons* for reciting π or for finishing on December 24. Maybe we ask him, "Why did you finish on December 24?" and he replies, "Well, it was my eternal intention so to do"—can we understand that? In the case of a being not constrained by space and time, such as God, maybe we can obtain an (admittedly obscure) apprehension of what this means. But in the case of a spatio-temporal being bound by the laws governing the transfer of information, energy, momentum, matter, and so on? Can we explain why, in the scheme of efficient causation, these words you are reading are being written by me today rather than yesterday, if I have been writing from eternity? The answer is, I submit, an emphatic "No."

Section 11

Finally, in paragraph two of this section Oppy "tentatively" offers an argument for the proposition that the Tristram Shandy paradox gives no support to the idea that an actually infinite collection cannot be formed by successive addition. First, he states: "If no collection formed by successive addition can be actually infinite, then any story involving an actually infinite collection formed by successive addition should seem as absurd as any other such story, when considered with respect to this feature alone" (349). Indeed—hence the heuristic force of TSP and of other thought experiments, and of imaginary scenarios such as that of the infinite library used by Craig to cast doubt on the idea of the actual infinite per se.

But then Oppy goes on to say that my own discussion aims to bring out that "many people suppose that there is a vast difference between the apparent acceptability of TSP_1 and TSP_5, even though both are stories involving an actual infinity *formed* by successive addition" (349, emphasis added). Hence if anything is wrong with TSP_5 it can't be a matter of its being an actual infinity formed by successive addition. And he adds, "If there is something wrong with this line of thought, I can't yet see what it is."

Let me help. It's not TSP_1 and TSP_5 which should be considered together, but TSP_2 and TSP_5. Remember, TSP_1 is simply the case of Shandy's recording his life eternally

into the future, such that no day of his life remains unrecorded. TSP_2, by contrast, is supposed to be the case where he *completes* his autobiography. It is *this* case which is supposed by the critic of the KCA (whatever Russell's equivocation) to be a case of an actual infinity *formed* by successive addition. And it is this case which fails to do the job for the reason already mentioned, that the longer Shandy lives the further he gets from his task. Many people do not (or at least should not) suppose there to be a vast difference between the acceptability of TSP_2 and TSP_5—neither is acceptable. Whatever else may be said about TSP_1, on the other hand, I am happy to assume purely for the purpose of present argument that there is nothing unacceptable about it. It is not a case of an actual infinity formed by successive addition, since the whole bite of the appeal to "formation" by the critic of the KCA is as another way of describing *completion*—that is, the very traversal of the infinite whose possibility is in question. In TSP_1 nothing is formed, nothing is completed: all there is is Tristram Shandy's eternal writing.

Notes

1 Section headings that follow refer to the section numbers of Oppy's article in this issue: Graham Oppy, "The Tristram Shandy Paradox: A Response to David S. Oderberg," *Philosophia Christi* 4 (2002): 335-49. In-text citations also refer to this article.

2 Let us leave to one side the debate about the A-theory and the B-theory of time. Craig is right to emphasize that the KCA depends on the truth of the A-theory. If the B-theory were true, temporal series of events could be created or given as blocks rather than formed by successive addition. That they could not be infinite would depend on the impossibility of actual infinities, which is the other limb of the KCA.

3 This remark may be too weak. See my comments on Section 11.

4 Graham Oppy, "Arguing About the *Kalam* Cosmological Argument," *Philo* 5 (2002): 32-59.

15

Methuselah's Diary and the Finitude of the Past

Ben Waters

> *There is no reason to suppose that the world had a beginning at all. The idea that things must have a beginning is really due to the poverty of our imagination. Therefore, perhaps, I need not waste any more time upon the argument about the First Cause.*
>
> Bertrand Russell, "Why I Am Not a Christian"

In a now well-known example, Bertrand Russell considered the case of Tristram Shandy, a character in a novel by Sterne who works on his autobiography at such a slow pace that it takes him one year to finish recording the history of a single day of his life.[1] Regardless of when Tristram Shandy starts working on his autobiography it will not be finished at the time of his death, as new material for his autobiography will accumulate at a faster rate than he can record it. However, if, as Russell additionally supposes, Tristram Shandy will not die, and will not cease from working on his autobiography, then it follows that each day finitely distant in the future from his birth will eventually be recorded in spite of the fact that Tristram Shandy is continually falling behind in his work.

More recently, Russell's example has been ingeniously modified by William Lane Craig for the purposes of demonstrating the finitude of the past.[2] In particular, Craig modified Russell's example by supposing instead that Tristram Shandy has been recording consecutive past days in his autobiography at a rate of one day per year from "eternity past." Craig maintained that in this case absurdities would result that disprove the possibility of an infinite past, arguing as follows:

> But let us turn the story about: suppose Tristram Shandy has been writing from eternity past at the rate of one day per year. Would he now be penning his final page? Here we discern the bankruptcy of the principle of correspondence in the world of the real. For according to that principle, Russell's conclusion would be correct: a one-to-one correspondence between days and years could be established so that given an actual infinite number of years, the book will be completed. But such a conclusion is clearly ridiculous, for Tristram Shandy could not yet have written *today's* events down. In reality he could never finish, for every day of writing generates another year of work. But if the principle of correspondence were descriptive of the real world, he should have finished—which is impossible.

> . . . But now a deeper absurdity bursts into view. For if the series of past events is an actual infinite, then we may ask, why did Tristram Shandy not finish his autobiography yesterday or the day before, since by then an infinite series of events had already elapsed? No matter how far along the series of past events one regresses, Tristram Shandy would have already completed his autobiography. Therefore, at no point in the infinite series of past events could he be finishing the book. We could never look over Tristram Shandy's shoulder to see if he were now writing the last page. For at any point an actual infinite sequence of events would have transpired and the book would have already been completed. Thus, at no time in eternity will we find Tristram Shandy writing, which is absurd, since we supposed him to be writing from eternity. And at no point will he finish the book, which is equally absurd, because for the book to be completed he must at some point have finished. What the Tristram Shandy story really tells us is that an actually infinite temporal regress is absurd.[3]

Although the precise details of Craig's argument are somewhat difficult to discern, it is clear that he thinks that for any day finitely distant in the past Tristram Shandy should be expected to have "finished" writing in his autobiography since for any such day Tristram Shandy will have been writing in his autobiography for an infinite collection of years that can be put in a one-to-one correspondence with the infinite collection of prior days finitely distant in the past in which he has lived. But then it follows that Tristram Shandy will not be writing in his autobiography in any day finitely distant in the past, which, as Craig observes, contradicts the fact that "we supposed him to be writing from eternity."

Unfortunately, this line of argument suffers from its dependence on the assumption that Tristram Shandy should be expected to have written about every day finitely distant in the past simply because he has been writing for an infinite collection of years that can be put in a one-to-one correspondence with the former collection of days. In particular, why on any such day couldn't Tristram Shandy have only written about an infinite proper subcollection of the days in which he has lived? After all, unlike finite collections, the elements of an infinite collection can always be put in a one-to-one correspondence with those of a proper sub-collection. Hence, it seems that this assumption requires further justification that Craig does not provide. Similarly, Richard Sorabji, David Conway, and Quentin Smith have all criticized Craig's argument along nearly identical lines;[4] however, it should be noted that their objections have not gone unanswered by Craig.[5]

In any case, a less problematic approach to deriving an absurdity from Craig's example was later found by Robin Small.[6] Small observed that if Tristram Shandy has been recording consecutive past days at a rate of one day per year then it follows that Tristram Shandy is always falling behind 364 days for every year (that is, 365 days) of work. Therefore, if Tristram Shandy has been working on his autobiography for at least one year then it follows that the most recent day he could be writing about today would be 364 days ago. Similarly, if he has been working on his autobiography for at least two years then it follows that the most recent day he could be writing about today would be

(364 + 364) days ago, and so on.[7] Hence, if Tristram Shandy has been working on his autobiography from eternity past then it follows that today he must be writing about a day that is infinitely distant in the past. Consequently, all that remains to demonstrate an absurdity in the case of Craig's example is to show that there are no infinitely distant past days.

However, even if an argument is given to demonstrate that there are no infinitely distant past days, the absurdity that would follow from Small's analysis is still not enough to demonstrate that the past is necessarily finite. For as noted by Wes Morriston, such an argument would have to proceed as follows:[8]

(1) If the past were infinite then it is possible that Tristram Shandy could have been recording consecutive past days at a rate of one day per year from eternity past.
(2) It is not possible that Tristram Shandy could have been recording consecutive past days at a rate of one day per year from eternity past.
(3) Therefore, the past is not infinite by (1) and (2).

Hence, the more significant difficulty with Craig's argument, or a similar argument that proceeded along the lines of Small's analysis, is that even if it succeeds in demonstrating that Tristram Shandy could not possibly have been recording consecutive past days at a rate of one day per year from eternity past it still remains to show (1), which is to say that Tristram Shandy *should* have been able to have done so given an infinite past. As Morriston observes, whatever absurdity one might find in Craig's example can be resolved just as easily by denying (1) as it can by denying that the past is infinite.[9] But how could one show that Craig's example *should* be possible if, in fact, it *isn't* possible? It seems that the requisite analysis would have to thread a very small needle. In any case, it is not enough to simply assert that the relevant scenario is "obviously coherent."[10] Morriston's point has gone unanswered.

Craig's modification of Russell's example has inspired a literature of its own.[11] The reason for this was aptly stated by Conway, "[other] arguments for the crucial premise that an infinite regress is impossible do little more than point out that infinite series have odd properties" but "[this argument] is supposed to show that the hypothesis of an infinite regress leads not just to 'oddities' but to real contradictions."[12] In the next section I will attempt to thread the aforementioned needle by arguing for the finitude of the past along lines similar to those explored in this introduction.

Methuselah's Diary

I first introduce some notation. Let t represent today, D the collection of all days prior to t, $\leq$ the total relation on D where $d_1 \leq d_2$ if and only if d_1 is earlier than or the same as d_2, and $=$ the relation on D where $d_1 = d_2$ if and only if $d_1 \leq d_2$ and $d_2 \leq d_1$ (that is, d_1 is the same as d_2). Furthermore, for any d in D and any positive integer n such that d

precedes t by at least $(n + 1)$ days let $(d + n)$ represent the unique nth day following d in D; similarly, if d does not follow a possible earliest day of D by less than n days let $(d - n)$ represent the unique nth day preceding d in D.[13] Finally, let D_F represent the subcollection of all days in D that are finitely distant in the past so that D_F only contains those days in D that are of the form $(t - m)$ for some positive integer m and not any possible days in D that are infinitely distant in the past.

With these conventions in mind, the argument is given as follows:

1. If there exists a function f from D_F to D_F such that $f(d) \leq d$ for any d in D_F and $f(d + 2) = (f(d) + 1)$ for any pair d, $(d + 2)$ in D_F then D is finite.
2. There exists a function f from D_F to D_F such that $f(d) \leq d$ for any d in D_F and $f(d + 2) = (f(d) + 1)$ for any pair d, $(d + 2)$ in D_F.
3. Therefore, D is finite by (1) and (2).

I establish (1) by first noticing that D_F is either a finite collection with an earliest day or the infinite collection $\{(t - n) \mid n \text{ is any positive integer}\}$ and assume that there exists a function f from D_F to D_F such that $f(d) \leq d$ for any d in D_F and $f(d + 2) = (f(d) + 1)$ for any pair d, $(d + 2)$ in D_F. Suppose D_F can be identified with the aforementioned infinite collection and observe that $f(t - 1) = (t - m)$ for some positive integer m. It follows that $(t - m) = f(t - 1) = f((t - (1 + 2m)) + 2m) = (f(t - (1 + 2m)) + m)$ so that $f(t - (1 + 2m)) = (t - 2m)$, which contradicts the fact that $f(t - (1 + 2m)) \leq (t - (1 + 2m))$. Hence, D_F cannot be the aforementioned infinite collection so that it is a finite collection with an earliest day e. Now, if e is not also an earliest day of D then it has a previous day $(e - 1)$ in D_F, which contradicts the fact that e is the earliest day of D_F. Hence, e is not only the earliest day of D_F but also the earliest day of D. However, if D has an earliest day that is finitely distant in the past then it follows that D is finite so that (1) is established.

I now establish (2) by considering the case of Methuselah, who has been alive for every d in D_F and is the oldest living individual. More pertinently, Methuselah has maintained a diary of his previous activities throughout his long life; however, he only works on entries for his diary in the evenings and never on more than one entry per day, with each entry summarizing his past activities for some d in D_F. Additionally, for any pair $(d - 1)$, d in D_F Methuselah has a perfect memory on d of everything he did on $(d - 1)$ and whenever he works on an entry for his diary it is always at a rate of half an entry per day. With these stipulations in mind, Methuselah works on entries for his diary in the following manner:

> For any d in D_F, if Methuselah remembers working on an entry for $(d - m)$ on a previous day $(d - 1)$ for some positive integer m then in the evening he will continue working on his diary where he had left off at the end of $(d - 1)$. In particular, if Methuselah had not finished working on an entry for $(d - m)$ then he will continue working on that entry, otherwise he will start working on an entry for $((d - m) + 1)$. On the other hand, if Methuselah does not remember working on such an entry on a previous day $(d - 1)$ then in the evening he will start working on an entry for d.[14]

Finally, I remark that Methuselah is thought of as belonging to a logically possible world that shares all the relevant temporal facts with the actual world.

It follows that for any d in D_F Methuselah will work on an entry for either d or one of $(d - m)$, $((d - m) + 1)$ for some positive integer m, but in any case he will work on an entry for a day in D_F that is earlier than or the same as d. Hence, there exists a function f from D_F to D_F such that $f(d_1) = d_2$ if and only if Methuselah works on an entry for d_2 on d_1 for any d_1, d_2 in D_F with $f(d) \leq d$ for any d in D_F. Finally, I observe that $f(d + 2) = (f(d) + 1)$ for any pair d, $(d + 2)$ in D_F since Methuselah always takes two consecutive days to finish writing an entry for his diary and he always works on subsequent days where he had left off at the end of previous days given his memory and the manner in which he works on entries for his diary in the evening of every d in D_F. Hence, f satisfies all the conditions needed to establish (2).

Remarks

In commenting on the previous argument I first remark that it is obviously valid and entails the finitude of the past. Secondly, I remark that the previous argument resolves the primary deficiency of the line of argument explored in the introduction by constructing a logically possible scenario concerning the diary-keeping activities of Methuselah that is for all intents and purposes equivalent to Craig's example concerning the autobiographical activities of Tristram Shandy. Thirdly, I remark that what distinguishes the previous argument for the finitude of the past from other such arguments is that it proceeds via the existence of a particular function from the collection of all days finitely distant in the past to itself that is incompatible with an infinite past. In particular, other approaches to demonstrating the finitude of the past in classical thought have typically proceeded along more general lines, such as the metaphysical impossibility of forming an infinite collection by successive addition or even the metaphysical impossibility of infinite collections themselves.[15] Fourthly, in contrast with those efforts, the previous argument perhaps enjoys a reduced risk of proving too much while taking place at the level of what is logically possible and not the more difficult level of what is metaphysically possible. Finally, I remark that the previous argument can be naturally generalized to apply to arbitrary countable sequences of temporal intervals $\{I_1, I_2, I_3, \ldots\}$ that recede into the past (that is, I_2 is earlier than I_1, I_3 is earlier than I_2 and so on). It follows that all such sequences must, in fact, be finite in length, which implies not only that the past is finite but also that it has a first moment.

Conclusion

In this space I have traced the development of a particular line of argument for the finitude of the past that arose from Craig's modification of Russell's Tristram Shandy example and showed how its primary deficiency could be addressed by constructing

a logically possible scenario concerning the diary-keeping activities of Methuselah as part of a new argument for the finitude of the past. Moreover, this argument can be naturally generalized to demonstrate not only that the past is finite but also that it has a first moment.

Notes

1 Bertrand Russell, *The Principles of Mathematics* (London: Clay and Sons, 1903), 358–9.
2 William Lane Craig, *The Kalām Cosmological Argument* (London: Macmillan, 1979), 98–9.
3 Ibid.
4 Richard Sorabji, *Time, Creation, and the Continuum: Theories in Antiquity and the Early Middle Ages* (Ithaca, NY: Cornell University Press, 1983), 222; David Conway, "It Would Have Happened Already: On One Argument for a First Cause," *Analysis* 44 (1984): sec. 3; Quentin Smith, "Infinity and the Past," *Philosophy of Science* 54 (1987): sec. 4.
5 William Lane Craig, critical notice of *Time, Creation, and the Continuum, International Philosophical Quarterly* 25 (1985): 319–26; William Lane Craig and Quentin Smith, *Theism, Atheism, and Big Bang Cosmology* (Oxford: Oxford University Press, 1993), 99–106; Paul Copan and William Lane Craig, *Creation out of Nothing: A Biblical, Philosophical, and Scientific Exploration* (Grand Rapids, MI: Baker Academic, 2004), 215–16.
6 Robin Small, "Tristram Shandy's Last Page," *British Journal for the Philosophy of Science* 37 (1986): 215–16.
7 The calculations allow for the possibility that Tristram Shandy can write about the same day on which he began working on his autobiography (e.g., Tristram Shandy writes in the evening about things that happened earlier in the day).
8 Wes Morriston, "Must the Past Have a Beginning?," *Philo* 2 (1999): sec. 3.
9 Ibid.
10 Copan and Craig, *Creation out of Nothing,* 214.
11 See also David S. Oderberg, "Traversal of the Infinite, the 'Big Bang' and the *Kalām* Cosmological Argument," *Philosophia Christi* 4 (2002): 305–34; Graham Oppy, "The Tristram Shandy Paradox: A Response to David S. Oderberg," *Philosophia Christi* 4 (2002): 335–49.
12 Conway, "It Would Have Happened Already," 159.
13 Note that if d is not an earliest day of D then it has a previous day ($d - 1$) in D.
14 This would include the case where d does not have a previous day ($d - 1$) in D.
15 See William Lane Craig, "Whitrow and Popper on the Impossibility of an Infinite Past," *British Journal for the Philosophy of Science* 30 (1979): sec. 1.

16

The Grim Reaper *Kalām* Argument: From Temporal and Causal Finitism to God

Robert C. Koons

The *kalām* argument for God's existence, which was pioneered by John Philoponus (490–570), developed by Islamic philosophers such as al-Kindi and al-Ghazali, and championed in recent years by William Lane Craig (Craig 1979) and by me (Koons 2014), is an attempt to prove that the universe must have had a cause, a role which God seems best suited to fit. The argument typically takes the following form:

1. Whatever begins to exist must have a cause.
2. The universe began to exist, because time itself is bounded in the past.
   Therefore, the universe had a cause.

The first premise has a great deal of intuitive appeal, and there are severe epistemological costs to countenancing the idea of uncaused origins. For instance, the skeptical scenario popularized by Bertrand Russell—How do we know that the universe didn't simply appear 5 minutes ago?—would be a live possibility in the absence of an *a priori* causal principle similar to premise 1. So, let's focus on premise 2. In Section 1, I will examine several strategies for defending premise 2. In Section 2, I will introduce Benardete's Grim Reaper paradox. Sections 3 and 4 will comprise the use of the Grim Reaper paradox to defend both the finitude of the past and the thesis of causal finitism. I will consider some objections in Section 5 and conclude in Section 6 with some arguments for deriving godlike characteristics from the eternal first cause.

1 The overall strategy for defending premise 2

The typical *kalām* strategy for defending premise 2 is to argue that time past is not eternal, that is, that there is some finite temporal bound to all past events. Now, it is not immediately obvious that a finite bound to the past entails that the "universe" began to exist. First, it is not obvious that there is such a thing as *the universe*: perhaps the plurality of things that exist at a time t do not compose a

single whole at *t*. We might try to avoid this composition question by modifying premise 2 into 2.1:

> 2.1 There is a time *t* such that everything existing at *t* began to exist at *t*, and nothing existed at any time prior to *t*.

In order to get the desired conclusion, we would also have to modify premise 1 as follows:

> 1.1 If some things *xx* began to exist at time *t*, then there must be some thing *y* or things *yy* not among the *xx* such that *y* (or the *yy*) caused the *xx* to begin to exist at *t*.[1]

We will also have to rule out the possibility that the things coming into existence at the first moment of time might have been caused by things existing at later times:

> 3. If the *yy* cause the *xx* to exist at *t*, then the *yy* exist at *t* or at some time earlier than *t* or eternally.

Form 1.1, 2.1, and 3, we can reach the conclusion that something that exists eternally caused the beginning to exist of all the things that existed at the first moment of time (if there is such a first moment).

There is, however, a further lacuna to fill: from the fact that the past is finite in extent or duration, it does not follow that there is a *first* moment of time. For example, it could be that no event occurs 14 billion or more years ago, but for every length of time L years less than 14 billion years, there are events that occurred exactly L years ago. That is, there might be a finite bound on the past, with past moments that approach arbitrarily close to that boundary, but no moment that reaches it, that is, no absolutely first moment. (Think of the set of positive real numbers, which approach arbitrarily close to zero without actually including it.)

Instead of looking for proof of the finitude of the past, we should look instead for support of what Alexander Pruss (2016) has called *causal finitism*. If we can show that every event has a finite causal history (i.e., no causal loops and no causal infinite regresses), then we can infer that there are *uncaused* events. If we can further assume that everything that begins to exist at a time must have a cause *and* that every non-eternal or fully temporal thing must have begun to exist at some time (because the past is finite), then we can conclude that all uncaused things must be eternal in nature (i.e., existing "outside" or "beyond" time itself). At that point, we might be able to show that such an eternal cause of temporal events must be relevantly godlike.

Here is a version of this Pruss-inspired argument:

> P1. Every event has a finite causal history (no causal loops or infinite regresses).
> P2. For everything that begins to exist (at some point in time), the event of its beginning to exist must have a cause.

P3. Every non-eternal thing began to exist at some point in time (since the past of each non-eternal thing is finite in length).

Therefore, every non-eternal thing is ultimately caused to exist by some eternal (godlike) thing.

Can we get the finitude of the past (P3) from Pruss's causal finitism (P1)? No, we can't, at least not in the context of relativity theory. Relativity theory enables us to distinguish between the past of an individual event (the "past light cone" of the event) and the past of the entire universe. If the universe is infinitely large (spatially), then it could be that each event has a finite past, but there could still be no finite bound on all of the universe's past light cones. However, to get the desired result (namely, the existence of an eternal or supra-temporal cause), we don't need for the past of the universe to be finite in extent. It is sufficient for the past *of each temporal thing* to be finite at each point in time.

Can we use causal finitism to get this narrower result?

Suppose that we have a thing x that exists in time and suppose that causal finitism is true. This means that each event in the history of x must have a finite causal history. Is this enough to entail that x must have begun to exist at some point in the past? Couldn't the history of x begin with an event or state that is infinitely extended in the past direction? Let's call such an initial state a *simple infinitely long past state* or SILPS.

We can refute the possibility of a SILPS by posing a dilemma: time itself either has an intrinsic measure (in which sense time can pass in the absence of change) or it does not. If time does *not* have an intrinsic measure, and the initial state of x is a simple state, without discrete parts, then that state cannot have any temporal duration, much less an infinite duration (since there are, ex hypothesi, no changes concurrent with this state by which time could be extrinsically measured). Hence, we must suppose that time itself has an intrinsic measure.

However, this is also inconsistent with a SILPS, since if time has an intrinsic measure, then any extended period of time has discrete proper parts corresponding to the measurable proper parts of that period of time. If an event or state has a duration corresponding to that extended period, then it too must have temporal parts corresponding to the proper parts of the period of time. Thus, the state is not simple or "uneventful" after all. This is a strong argument, although it will not persuade those who think that extended simples (like extended Democritean atoms) are metaphysically possible.

Here is a version of the argument without the assumption of a finite past (P3):

P1. Every event has a finite causal history (no causal loops or infinite regresses).
P2. For everything that begins to exist, the event of its beginning to exist must have a cause.
P3.1 If something has existed for an infinite period of time, then it must have an infinite causal history (because a simple infinitely long past state is impossible).

Therefore, every non-eternal thing is ultimately caused to exist by some eternal (godlike) thing.

Since my argument for P3.1 is less than ironclad, I will argue *both* for causal finitism (in Section 4) *and* for the finitude of the past of each temporal thing (in Section 3). This provides support for both arguments: the original argument (which depends on both causal finitism and the finite duration of the past) and the revised argument (which depends on causal finitism and the impossibility of SILPS).

2 Benardete's Grim Reaper paradox

In Jose Benardete's paradox, we are to suppose that there is an infinite number of Grim Reaper mechanisms, each of which is engineered to do two things: first, to check whether the victim, Fred, is still alive at the Grim Reaper's appointed time, and, second, if he is still alive, to kill him instantaneously, and, if he is already dead at the appointed time, to do nothing. The last Grim Reaper (Reaper 1) performs this dual task at exactly one minute after noon. The next-to-last Reaper, Reaper 2, is appointed to perform the task at exactly one-half minute after noon. In general, each Reaper number n is assigned the moment $1/2^{n-1}$ minutes after noon. There is no first Reaper: for each Reaper n, there are infinitely many Reapers who are assigned moments of time earlier than Reaper n's appointment.

It is certain that Fred does not survive the ordeal. In order to survive the whole ordeal, he must still be alive after one minute after twelve, but, we have stipulated that, if he survives until 12:01 p.m., then Reaper 1 will kill him. We can also prove that Fred will not survive *until* 12:01, since in order to do so, he must be alive at 30 seconds after 12, in which case Reaper 2 will have killed him. In the same way, we can prove that Fred cannot survive until $1/2^{n-1}$ minutes after 12, for every n. Thus, no Grim Reaper can have the opportunity to kill Fred. Thus, it is impossible that Fred survive, and also impossible that any Reaper kill him! However, it seems also to be impossible for Fred to die with certainty and yet to do so without any cause.

The original Grim Reaper paradox requires some assumption about causality: that Fred cannot die unless someone or something kills him. I would like to eliminate that dependency. Consider the following variation: the Grim Placer. In place of asking whether a preexisting victim Fred is dead or alive, we will focus instead on the question of whether or some Grim Placer has issued a death warrant. Let's say that each Grim Placer #n can issue a death warrant by placing a particular kind of point-sized particle in a designated position, at exactly the distance of $d/2^n$ meters from a plane P. Each Grim Placer #n checks to see if a particle is already at a distance of $d/2^i$ meters from plane P, for some $i > n$: that is, he checks to see if any earlier Placer has issued a "warrant." If a particle has already been placed in one of the designated spots, then the Grim Placer #n does nothing, other than maintaining the status quo.

If there is no particle in an appropriate location, then the Grim Placer #n issues his warrant, placing a particle exactly $d/2^n$ meters from P. We can now prove both that at 12:01 that some particle is located within d meters of the plane, and that no particle is located there. Suppose that there is no particle at any location $d/2^i$ meters from plane

P, for any *i*. This is impossible, since if there were no particle $d/4$ meters from P, then Grim Placer #1 would place a particle in the position $d/2$ meters from P.

Thus, there must at 12:01 p.m. be some particle in an appropriate position. Suppose that the particle is located at that time in position $d/2^n$ meters from P, for some *n*. This means that every Grim Placer whose number is greater than *n* did nothing, contrary to our hypothesis. Thus, this option is also impossible.

3 From the Grim Reaper to a finite past

As Alexander Pruss has observed (Pruss 2009), the Grim Reaper paradox suggests not only that no finite time period can be divided into infinitely many subperiods but also that it is impossible that there should exist infinitely many time periods, all of which are earlier than some event. It seems to provide grounds for thinking that time must be bounded at the beginning: that there must be a first period of time. If not, we could simply construct a new version of the Grim Placer paradox. As in the original version, we postulate the possibility of a Grim Placer, who creates a particle and places it at a designated spot, if and only if no particle is already located at a spot corresponding to any earlier Placer. In this version, Placer 1 is set to act at the first moment of 1 BCE, Placer 2 at the first moment of 2 BCE, and so on ad infinitum. Once again we can generate the contradiction: some particle must be placed within *d* meters of the plane, but there is no finite distance from the plane such that a particle could have been placed there.

Let us try to be more explicit about the premises needed to generate the paradox. First of all, we must assume that a single, isolated Grim Placer scenario is metaphysically possible:

P1. Possible Grim Placer. There is a number *d* such that for every positive integer *n* there is a possible world W and a region R such that R has a finite temporal duration *d* seconds, there is a Grim Placer wholly contained within R, and throughout R the Grim Placer has the power and disposition to create a "Fred" particle and place it at a designated position $d/2^n$ meters from the plane P if there is no unique particle located at $d/2^i$ meters from P for some $i > n$ (eliminating all other particles located within *d* meters of P, if there are more than one), and otherwise to maintain the unique Fred particle that is located at $d/2^i$ meters from P in its initial position.

Secondly, we appeal to some version of David Lewis's Patchwork Principles (Lewis 1983: 76–77). Much, if not most, of our knowledge of possibility is based on patchwork principles, since we have little direct access to alternative possibilities. Instead, we have to rely on our direct knowledge of the actual world, as well as the license to cut-and-paste or recombine various regions of the actual world into a new arrangement.

Binary Spatiotemporal Patchwork. If possible world W_1 includes spatiotemporal region R_1, possible world W_2 includes region R_2, and possible world W_3 includes R_3, and R_1 and R_2 can be mapped onto nonoverlapping parts of R_3 ($R_{3.1}$ and $R_{3.2}$) while preserving all the metrical and topological properties of the three regions, then there

is a world W_4 and region R_4 such that R_3 and R_4 are isomorphic, the part of W_4 within $R_{4.1}$ exactly duplicates the part of W_1 within R_1, and the part of W_4 within $R_{4.2}$ exactly duplicates the part of W_2 within R_2.

Following Lewis, I will assume that "intrinsicality" and "exact duplication" are inter-definable:

Definition of Intrinsicality: a property P is *intrinsic* to a thing x within region R in world W if and only if x is P throughout R in W, and every counterpart of x in any region R' of world W' whose contents exactly duplicate the contents of R in W also has P throughout R'.

Binary Spatiotemporal Patchwork licenses recombining region R_1 from world W_1 with region R_2 from world W_2 in any way that respects the metrical and topological properties of the two regions, so long as there is enough "room" in space-time as a whole to fit the two regions in nonoverlapping locations (as witnessed by the two regions $R_{3.1}$ and $R_{3.2}$ in world W_2). The binary patchwork principle can plausibly be generalized to the case of infinite recombinations:

P2. Infinite Spatiotemporal Patchwork (PInfSP). If S is a countable series of possible worlds, and T a series of regions within those worlds such that T_i is part of W_i (for each i), and *f* is a metric and topology structure-preserving function from T into the set of spatiotemporal regions of world W such that no two values of *f* overlap, then there is a possible world W* and an isomorphism *f** from the spatiotemporal regions of W to the spatiotemporal regions of W* such that the part of each world W_i within the region R_i exactly resembles the part of W* within region $f^*(f(R_i))$.

In order to apply the patchwork principles to Benardete's story, we must assume that the relevant powers and dispositions are intrinsic to the things that have them when they have them. Otherwise, we cannot assume that the joint possibility of an infinite number of Grim Placer scenarios follows from the possibility of a single scenario, taken in isolation.

Intrinsicality of the Grim Placers' Powers and Dispositions. The powers and dispositions ascribed to each Grim Placer are properties intrinsic to that Placer in its corresponding region and world.

Our hypothesis for the reductio will be the possible existence of a world with an entity that has an infinite past:

HIP. Hypothesis of the Possibility of an Infinite Past. There exists a possible world W′ and a spatiotemporal region R′ in W′ such that R′ has infinitely many temporally extended parts such that these parts can be put into a sequence (ordered by the natural numbers) in which each successive part in the sequence is within the backward time cone of its predecessor, and each part is large enough to contain a Grim Placer.

1. Start with a possible Grim Placer in world W and region R, with finite duration *d* (from the Possibility of Grim Placer (PGP)).
2. Next, locate a world W' with a region R' containing a non-well-founded infinite series of nonoverlapping temporal parts, each of duration d and each in the backward time cone of its predecessor (assumption of the Hypothesis of the Possibility of an Infinite Past [HPIF], for reductio).

3. Find a single possible world W* with region R* containing a non-well-founded infinite series of nonoverlapping temporal parts (R_1, R_2, etc.), with each R_i containing a counterpart of the Grim Placer (from 1, 2, the Infinite Spatiotemporal Patchwork Principle [**PInfSP**] and the Principle of the Intrinsicality of the Grim Placer's Powers and Dispositions)**.**
4. Assume that, in world W*, there is after period R_1 no particle located at any distance $d/2^n$ from P, for any $n > 0$ (assumption for second reductio).
5. Therefore, there is after period R_2 no particle located at any distance $d/2^n$ for any $n > 1$ (from 4).
6. Grim Placer #1 in period R_1 in world W* placed a Fred particle at distance $d/2^n$ from P (from 5, and the PGP).
7. Contradiction (4 and 6). So, after R_1 in W*, there is some particle located at some distance $d/2^n$ from P, for some $n > 0$.
8. Therefore, no particle is located any distance $d/2^j$ from the plane P, for any $j > n$ (from 7, and the PGP).
9. Therefore, no particle is located any distance $d/2^j$ from the plane P, for any $j > n+1$ (from 8).
10. Therefore, Grim Reaper $n + 1$ placed a particle at distance $d/2^{n+1}$ from P (from 9, and the PGP).
11. Contradiction (9 and 10).
12. So, there is no possible world containing a non-well-founded infinite series of non-overlapping temporal parts, each of duration d_0 and each in the backward time cone of its predecessor. (negation of HPIF).

From the conclusion of this argument (step 12), we can deduce premise P3:

> P3. Every noneternal thing began to exist at some point in time (since the past of each non-eternal thing is finite in length).

If any temporal thing had an infinitely long past, then that past would include an infinite series of non-overlapping periods of length *d*, all in the past light cone of the current state of the thing in question, in contradiction to step 12. Thus, to reach the conclusion of an eternal first cause, we need only add the assumption of causal finitism. In the next section, I will argue that the Grim Placer paradox can be generalized into an argument for causal finitism.

4 From the Grim Reaper to causal finitism

Lewis's Patchwork Principle allows us to construct possible worlds using a spatiotemporal framework and a localized "patch" of possibility. It is very plausible that the same sort of principle would apply when we consider possible causal networks. If there is a world in which the structure of causal connections realizes a certain pattern, then we should be able to construct a new possible world by replacing each causal

node in that world by a localized causal "patch" consisting of a small event with its immediate causal antecedents and consequents.

I will assume that a causal network in a world can also be cashed out in terms of causal powers. If node n_1 is linked by a directed edge to n_2, then the event $e(n_1)$ corresponding to node n_1 should include some entity's having some causal power relevant to the occurrence of event $e(n_2)$.

Suppose that N is a directed graph, consisting of nodes and directed edges, representing some of the causal-power connections of this kind in possible world W_0. That is, every node in N is an event in W_0, and whenever nodes n_1 and n_2 are connected by a directed edge from n_1 to n_2 in N, the event $e(n_2)$ is causally dependent on event $e(n_1)$ in W_0, in the sense that the event $e(n_1)$ includes the existence of some entity with the causal power to influence the occurrence of event $e(n_2)$. Now suppose that we find a function g from the nodes of N to events in a set of worlds U, such for every event-node n_i in N, $g(n_i)$ is an event in a possible world W_i, where for every node x that is a predecessor of n_i in N, there is in world W_i an event y such that y is an exact duplicate of $g(x)$, regardless of the world in which $g(x)$ is located, and for every node z that is a causal successor of n_i in N, there is in world W_i an event u that is an exact duplicate of $g(z)$. Then there should be a single world W* containing exact duplicates $d(g(n_i))$ of each of the events $g(n_i)$ forming in W* a causal-power network corresponding to N. That is, if n_j is causally dependent on n_i in N, then $d(g(n_j))$ is causally dependent on $d(g(n_j))$ in W*. Let's call this the Causal Power Network Patchwork Principle (CPNPP).

Now assume that causal finitism is false, that is:

Hypothesis of Causal Infinitism. There is a possible world W containing an infinite descending chain of causal-power dependencies.

Now, all we need is to assume that there is a single possible world W_t that contains three causally connected Grim Placers: Grim Placers 1, 2, and 3, each of whom has the power to place a particle at a distance of $d/2^n$ meters from the plane (for n = 1, 2, or 3), and each of whom is disposed to place a particle there if and only if no Placer with a larger number has already placed a particle within d meters of the plane, with Placer 1's choice causally dependent on Placer 2's choice, and Placer 2's choice causally dependent on Placer 3's. Call this the possibility of a Placer trio (PPT).

Now, all we have to do is to combine both the PPT and the possibility of causal infinitism with the CPNPP and the intrinsicality of the Grim Placers' causal powers to derive our familiar contradiction. We want a constructed world W* in which all the nodes of the causal regress are filled by events that duplicate the Grim Placer scenario. The PPT ensures every individual Grim Placer event in that regress can be immediately preceded and succeeded by another duplicate of the GP event. Consequently, we can deduce both that there will be, in the constructed W*, some particle within d meters of P, and that there can be no particle within d meters of P, a contradiction. Since the PPT and Intrinsicality of Causal Power are obviously true, we can deduce the falsity of the Possibility of Causal Infinitism. Thus, we can deduce a version of causal finitism:

No Causal Regresses. There is no event in any world whose causal-power history of contains is an infinitely descending chain.

We can also use a version of the Time-Travel Grandfather paradox to exclude the possibility of causal loops. We can then defend a version of the original, Pruss-inspired *kalām* argument:

PP1.1 There is no event in any world whose causal-power history contains an infinitely descending chain.
PP1.2 There are no loops in the causal-power history of any event in any world.
PP2.1 For everything that begins to exist (at some point in time), there must exist some entity with the causal power to influence the event of its coming into existence.
PP2.2 If entity *x* has the causal power to influence the beginning of the existence of entity y, and entity *y* has the causal power to influence the beginning of the existence of entity *z*, then entity *x* has the causal power to influence the beginning of the existence of entity *z*.
P3. Every non-eternal thing began to exist at some point in time (since the past of each non-eternal thing is finite in length).

Therefore, every non-eternal thing is ultimately caused to exist by some eternal (and therefore godlike) thing.

Suppose that x_1 is a non-eternal thing. By P3, x_2 began to exist at some time *t*. By PP2.1, there is some entity x_2 with the causal power to influence x_1's beginning to exist. By P3, x_2 also began to exist, and by PP2.1 again, there is some x_3 with the causal power to influence x_2's beginning to exist. By PP2.2, x_3 has the causal power to influence x_1's beginning to exist. Premises P1.1 and P1.2 require that this chain of causal connections must terminate in some entity *y* with the causal power to influence the beginning to exist of all the other members of the chain. To avoid an infinite regress or vicious loop, we must (given P3) conclude that entity *y* is an eternal being.

5 Objections

5.1 Neo-humeanism

The argument does not depend on assuming that all powers and dispositions are intrinsic, but it does depend on assuming that some are (namely, the powers and dispositions definitive of the Grim Placer scenario). On a neo-Humean account of causal powers (as advocated by David Lewis and Theodore Sider—Lewis 1986 and Sider 2000), any power or disposition of anything depends on the pattern of events involving similar things across the history of the world. If this neo-Humean account is right, then the patchwork principles do not apply to scenarios specified in terms of causal powers or dispositions.

However, the very fact that neo-Humeanism entails the extrinsicality of powers and dispositions provides compelling grounds for rejecting it. The neo-Humean account gets the order of explanation between powers and their manifestations wrong, making

the possession of powers dependent on the pattern of manifestations. Any modification of the neo-Humean account that avoids this consequence would be compatible with the intrinsicality of the relevant powers and dispositions, and the applicability of patchwork to the Grim Reaper scenarios.

5.2 The amazing vanishing particle

The Grim Placer argument tacitly assumes that once a particle has been created and placed in a particular position, it persists there throughout the rest of the GP sequence. Why not suppose instead that in such a case infinitely many particles would be generated by infinitely many Grim Placers, with each particle spontaneously vanishing at some time between its production and the production of the next particle? The vanishing particles could be supposed either to simply cease existing altogether without a trace, or to be transported instantaneously to a distant location or parallel universe.

What's really required for the argument to work is an assumption about the persistence of signals of a certain kind. When a Grim Placer fails to find a "Fred" particle in any appropriate region of space, he is in effect receiving a null signal from his predecessors. He is then supposed to send a signal (in the form of an appropriately placed Fred particle) to all of his successors to the effect, "I, GP number *n*, am the first to have acted." We can re-formulate the argument in a way that removes all reference to the particle. What's essential is that each "Grim Signaler" (GS) (to change the name) has the passive power of receiving any signal sent by a predecessor (if there is in fact one), and the active power of sending a signal (of the form "GS *n* was the first to initiate this signal") to a successor GS (again, if there is one). This pair of passive and active powers is intrinsic to each GS.

The GS version assumes that each GS has the power of acting directly on its successor (if there is one). Doesn't this require the various regions to overlap one another, in order to avoid action at a distance (thereby violating the no-overlap condition of the spatiotemporal patchwork principles (SPPs))? Not necessarily. Each region could have a topologically closed boundary in the direction of the future and an open boundary in the direction of the past. In this way, each pair of regions could be adjoining without overlapping.

5.3 Conflict between the *Kalām* causal principle and patchwork principles

There is a problem with using the Grim Reaper paradox in combination with any of the *kalām* causal principles (premises P2 or PP2.1): the necessary truth of one of these *kalām* causal principles is incompatible with the SPPs (both Binary and Infinitary) upon which the argument for the finitude of the past is based. Take a world in which some change is caused at time *t*, and take a second world in which there exists no possible cause of that change prior to *t*. The binary SPP entails that there is a possible

world like the first at and after *t*, and like the second before *t*, providing a counter-example to our *kalām* causal principles.

There are four possible responses, all of which have merit.

1. This objection does not apply to the causal-power patchwork principle, since that principle requires that the constructed world preserve the causal structure of the original framework-providing world. Thus, the revised version of the argument (relying on causal finitism and the impossibility of SILPS) is untouched.
2. I could deny that any of the *kalām* causal principles (P2 or PP2.1) is a necessary truth. It could be that the principles hold in all nearby worlds or nearly all nearby worlds (as a kind of nomological necessity), or it could be that the correct causal principle is a defeasible, exception-permitting generalization (as I argued in Koons 1997).
3. I could insist that the causal principles are metaphysically necessary and claim only that the patchwork principles are strong but defeasible principles. One should not admit exceptions to an SPP without strong, non-ad-hoc reasons. The causal principles provide such reasons, but no such reason is available for the defender of the possibility of an infinite past.
4. I could add a causal proviso to the SPPs, permitting the inference to possibility only in those cases in which all beginnings have adequate causes in the constructed scenario. The revised patchwork principle would be logically weaker than (entailed by) the original, and it would still be adequate for the Grim Reaper/Placer argument, since the Grim Reaper stories are ones in which each event has an adequate cause in the preceding period.

6 From cause of the universe to God

The argument so far has given us the existence of at least one eternal or nontemporal cause of temporal events, with all temporal events ultimately caused by one or more of these eternal entities. The eternal beings have causal power but stand outside the flux of time.

What is involved in being a nontemporal entity with causal powers? It would seem that to stand outside of temporal relations altogether, a being would have to be not only eternally unchanging but also necessarily unchangeable, a being of "pure act" (to use Aristotelian language), with no possibility of unrealized potentialities. As Thomas Aquinas convincingly argues (in the *Summa Theologiae*, Part I, Question 3 and in the *Summa Contra Gentiles*, Part One, Chapters 16–28), such a being of pure act would have to be simple, incorporeal, and immaterial.

How could such a simple, immaterial, and unchangeable entity be the cause of temporal events? We have only one applicable model: that of the intentional relation between an author and a story, or between a composer and a musical work. In these cases, the internal time of the creator is disjoint from the internal time of the creation: the creator is "eternal" relative to the creation. Thus, the eternal cause of temporal

events must be something like a mind—a simple, unchanging activity of pure thought, which brings about a changing world by a kind of fiat, an act of creative will.

In addition, as I argued in Koons 1997, a first-cause argument can be combined with various versions of the design argument (pointing to the uniformity and simplicity of laws, the fine-tuning of the constants and initial conditions, or the rapidity of the origin of life) to reach the conclusion that there must be one, intelligent eternal cause of the observed universe.

Note

1 I am using double letters as plural variables, following George Boolos's plural quantification (Boolos 1984). One should read "yy" as "the y's (plural)."

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17

Endless Future: A Persistent Thorn in the *Kalām* Cosmological Argument

Yishai Cohen

1 Introduction

William Lane Craig has vigorously defended *The Kalām Cosmological Argument* (*KCA*):[1]

1. Whatever begins to exist has a cause for its coming into existence.
2. The universe began to exist.

Therefore,

3. The universe has a cause for its coming into existence.

One of Craig's central sub-arguments for the truth of (2) is *The Argument from the Impossibility of an Actual Infinite* (*AIAI*) (Craig and Sinclair 2009: 103-117):

4. An actual infinite cannot exist.
5. An infinite temporal regress of events is an actual infinite.

Therefore,

6. An infinite temporal regress of events cannot exist.

Craig's argument for (4) appeals to certain alleged absurdities that would follow if (4) were false. Since such alleged absurdities are intuitively metaphysically impossible, we should conclude that (4) is true. Now, while much of the action concerning *AIAI* has been aimed at (4), Wes Morriston (2010; 2012) has recently attempted to cast doubt on the truth of the conjunction of (4) and (5). Morriston contends that Craig's argument for (6) results in an equally good argument for the impossibility of an endless future, or at least a pre-determined one (Cf. Hedrick 2014). But since a pre-determined, endless future certainly seems possible, we should therefore be skeptical that Craig has shown that the universe must have a beginning, at least via *AIAI*. Call this *Morriston's Objection*.

Craig denies that *AIAI* may also support the impossibility of an endless future. My intention in this paper is to further advance *Morriston's Objection* in a number of ways.

I begin by critically assessing the metaphysical assumptions behind Craig's reply to *Morriston's Objection.* More specifically, I show that Craig's reply reveals a commitment to an unmotivated position concerning the relationship between actuality and the actual infinite.[2] Additionally, I consider alternative arguments for the impossibility of a beginningless past offered by Pruss (2009), Loke (2014), and Koons (2014). I argue that, despite initial appearances, these arguments also seem to be subject to *Morriston's Objection.* Hence, the apparent possibility of an endless future continues to be a thorn in the side of the *KCA*.

2 The Craig-Morriston Exchange

As previously noted, according to *Morriston's Objection,* Craig's argument for (6) results in an equally good argument for the following:

7. An endless series of events is impossible.

Nowhere does Craig indicate that he wishes to bite the bullet and accept (7), and rightly so. For, it certainly seems possible for there to be an endless future. Now, In support of *Morriston's Objection,* Morriston (2010: 455) invites us to consider *The Angelic Praise Scenario*: God decrees that two angels, Uriah and Gabriel, will take turns praising God for one minute of 'celestial time' without end. *The Angelic Praise Scenario* results, *inter alia,* in two alleged absurdities. First, if God were to have decreed instead that there be a one celestial minute gap between each pair of praises, then, an actual infinite number of praises could be added within that one celestial minute gap. Second, if God were to have decreed instead that Uriah and Gabriel stop after four instances of praising God, then an actual infinite number of praises would have been prevented, and only four praises would occur. However, if God were to have decreed instead that only Gabriel praise God forever, then an actual infinite number of praises would have been prevented (viz. those of Uriah), and yet an actual infinite number of praises would still have occurred (viz. those of Gabriel).

Since these alleged absurdities are similar in kind to the alleged absurdities that follow from a beginningless past, it follows that Craig's argument against the possibility of a beginningless past results in an equally good argument against the possibility of an endless future, or at least a pre-determined one. Thus, to the extent that we are skeptical of the impossibility of a pre-determined endless future, we should similarly be skeptical of Craig's argument for the impossibility of a beginningless past.

In response, Craig (2010: 455) says that the answer to the question 'What is the number of praises in the series of future praises [in *The Angelic Praise Scenario*]' is 'none'.[3] It is unclear what 'none' means. We should not, I think, understand 'none' to refer to the number zero. For, to say that the number of praises that will occur is zero is to say that there are no praises that will occur (van Inwagen 2009: 482-492). But that is clearly false since God's decree entails that some praises will occur. Perhaps Craig wishes to hold that the number of praises that will be uttered in *The Angelic Praise*

Scenario is indefinite, undetermined, undefined, or something to that effect. For the sake of argument, I will assume that this reply is both coherent and not obviously false (as would be the case if 'none' referred to the number zero). What I wish to focus on instead is what metaphysical assumptions Craig makes (or at any rate must make) in order to offer such a reply without *also* being committed to the claim that the number of past events in a beginningless universe is none.

3 Keeping Score of Craig's Metaphysical Assumptions

To all appearances, Craig seems to think that his position that the number of future praises in *The Angelic Praise Scenario* is none is entailed by the A-theory of time. For, Craig (2010: 456) emphasizes that on the A-theory of time, and in accordance with the medievals' position on actuality, while the past and present are parts of the actual world, the future is not a part of the actual world.[4]

A possible world is standardly understood to be a maximal possible state of affairs which concerns not only what has occurred or what is occurring, but also what *will* occur.[5] Now, perhaps there is no fact of the matter concerning which possible world is actual given that the future is not fully determinate. Perhaps there is only a fact of the matter concerning which worlds are *not* actual given that their being actual is incompatible with what has occurred in the past or with what is occurring in the present. However Craig (1990) himself seems to accept that the future *is* fully determinate.[6] Hence, if the future is fully determinate, it is unclear to me why we should think that, unlike the past and the present, the future is not part of the actual world. Regardless, I will grant Craig this assumption for the sake of argument.

Next, even given Craig's view of actuality, Craig is *at best* entitled to the position that if the A-theory is true and the moving spotlight view is false, then the number of future praises uttered by Uriah and Gabriel is none. For, according to the moving spotlight view, both eternalism and the A-theory are true. Thus, according to the moving spotlight view, even though only one moment of time is privileged with the status of being present, both past and future events still exist *simpliciter.*[7] So, if future events exist *simpliciter,* then future events are surely part of the actual world. Otherwise, Craig would be committed to denying the plausible claim that if x exists then x is actual.[8]

Perhaps Craig doesn't take into account the moving spotlight view because he finds it to be implausible. At any rate, Craig seems to be most directly concerned with the soundness of *AIAI* given the truth of presentism.[9] So, for the sake of argument, I will assume the truth of presentism in addition to assuming Craig's position on actuality. There are, however, still more assumptions that Craig adopts in his full-fledged response to *Morriston's Objection*.

If the number of future praises in *The Angelic Praise Scenario* is none given presentism, a worry immediately arises that the number of past events in a beginningless universe is likewise none given the truth of presentism. After all, if the number of future praises in *The Angelic Praise Scenario* is none just because future praises don't

exist *simpliciter* given the truth of presentism, then we should likewise think that the number of past events in an endless universe is none just because past events don't exist *simpliciter* given the truth of presentism. In response to this objection, Craig (2010: 454) emphasizes his position on actuality as described above, and adds that Morriston must 'find something that is part of reality which is actually infinite in quantity in order to make an analogy with a beginningless series of past events.' I think we can thus charitably interpret Craig to be committed to the following principle:

> ***The Actuality-Infinity Principle:*** In order for x to be actually infinite in quantity, x must be actual.[10]

I will return to this principle later. More specifically, I will argue that, without this principle, Craig cannot successfully rebut *Morriston's Objection.*

Now, there is one final objection that sheds light on Craig's metaphysical assumptions. If the future is fully determinate, then even if what will exist is not part of the actual world, one can still consistently maintain that in *The Angelic Praise Scenario* there are an actual infinite number of true propositions concerning the angels praising God at each future moment. According to Craig's (2010: 454) reply, assuming Platonism with respect to propositions is unjustified in this dialectic. The reason is that a commitment to Platonism *already* commits one to an actual infinite number of propositions since, for any proposition *p,* there is a further proposition that it is true that *p* (Cf. Morriston 2003 and Moreland 2003).

Suppose we grant Craig for the sake of argument that Platonism about propositions is false. Still, it is important to see that even if Platonism about propositions is false, it is still the case that there *are* propositions (albeit non-fundamental ones), sentences, or at least *something* that can be past-tensed, future-tensed, and have a truth-value. In other words, if it is true in *The Angelic Praise Scenario* that Gabriel will praise God at time *t,* and that Uriah will praise God at time $t + 1$, then there are at least two future-tensed truths, whereby these truths are propositions (albeit non-fundamental ones), sentences, or something else that can have a truth value (Morriston 2012: 448). But doesn't this mean that there are an actual infinite number of truths if the future is endless and the future (or some aspect thereof) is fully determinate? To understand Craig's answer to this question, we must turn to Craig's position on God's knowledge.

Since God's knowledge is complete, and (irrespective of the truth of Platonism about propositions) there are future-tensed truths, in order to avoid the position that the number of truths that God knows in *The Angelic Praise Scenario* is an actual infinite, Craig (2010: 454) resorts to the position that God's knowledge is non-propositional. Instead, God has a simple, non-propositional intuition of all reality (Cf. Alston 1986). So, although the future is fully determinate, and thus for any future-tensed statement (or a non-fundamental proposition, sentence, etc.) one considers, that statement will be true or its negation will be true, our knowledge of a fully determinate future in an endless universe can never be complete since that would require attaining knowledge of an actual infinite number of truths. Instead, our knowledge of a fully determinate

future in an endless universe can at best increase without limit. While there are a number of questions that arise regarding this position, let's grant Craig this position for the sake of argument.

So, with the exception of the *Actuality-Infinity Principle,* the following are the metaphysical assumptions upon which Craig relies and to which I do not object for the purposes of this paper:

i. The A-theory of time is true.
ii. Presentism is true.
iii. Unlike the future, the past and the present are parts of the actual world.
iv. Platonism about propositions is false.
v. God's knowledge is non-propositional.

What I want to assess, then, is whether Craig can rebut *Morriston's Objection* without appealing to the *Actuality-Infinity Principle*. I will now argue that he cannot. In other words, assumptions (i)-(v) alone cannot establish a relevant difference between the past and the future, such that (5) is true and the following is false:

8. An infinite temporal progress of events is an actual infinite.[11]

In order to see this, we need to take a closer look at what (5) and (8) might mean.

4 'An Infinite Temporal Regress of Events is an Actual Infinite'

To begin, it would have been better to replace 'an infinite temporal regress' in (5) with 'an endless temporal regress'. For, one might be tempted to take (5) to be an analytic truth. But then notice that we may similarly take (8) to be an analytic truth. If Craig were to grant that, like (5), (8) is an analytic truth, then Craig would surely also say that an endless future implies an endless temporal progress of events but not an infinite temporal progress of events. But then, in order not to beg any questions, we should take a beginningless past to imply a beginningless temporal regress of events, but not necessarily an infinite temporal regress of events. So, while I will not deviate from Craig's wording, I note that we must be first and foremost concerned with the implications of a beginningless past and an endless future. Hence, I will not take (5) or (8) to be analytic truths. Instead, I will understand 'an infinite temporal regress' to concern a beginningless past, and 'an infinite temporal progress' to concern an endless future. With this caveat in place, here is the first interpretation of (5) that I offer:

(5_1) An infinite temporal regress of events implies that there are past events such that the number of them is an actual infinite.

As Morriston (2012: 448) and Landon Hedrick (2014: 35) point out, given assumption (i) that presentism is true, (5_1) is false. For, to say that there *are* past events is to say that

past events *exist.*[12, 13] But according to presentism, it is false that past events exist. So it is false that there *are* past events. *A fortiori,* it's false that there *are* past events such that the number of them is an actual infinite. So we need a different interpretation of (5) in order for (5) to come out true.

The second and third interpretations of (5) and (8) we may consider employ primitive tensed operators. Following Arthur Prior's (1957; 1967; 1969) tense logic, there are the following four tensed operators:

P 'it has at some time been the case that'
F 'it will at some time be the case that'
H 'it has always been the case that'
G 'it will always be the case that'

Accordingly, (5) may be interpreted in either of the following ways:

(5$_2$) An infinite temporal regress of events entails that *P*(there are past events such that the number of them is an actual infinite).
(5$_3$) An infinite temporal regress of events entails that *H*(there are past events such that the number of them is an actual infinite).

If presentism is true, both (5$_2$) and (5$_3$) are false. There was no moment of time in the past such that it was true at that time that there *are* past events such that the number of them is an actual infinite. If presentism is true, for any past moment of time *t,* it was true at *t* that the only events that exist are those that exist at *t.* In other words, for any past moment of time *t,* it was strictly speaking false at *t* that 'there *are* past events', just as it is strictly speaking false *now* that there *are* past events (recall my remarks on (5$_1$)). *A fortiori,* it was strictly speaking false that that there are past events such that the number of them is an actual infinite. So (5$_2$) is false. Moreover, since this line of reasoning applies to *any* past time, we can generalize these results to *all* past times in order to arrive at the conclusion that (5$_3$) is similarly false.[14]

The final two interpretations of (5) I will consider may well be one of the interpretations that Craig wishes to adopt:

(5$_4$) An infinite temporal regress of events entails that there were past events such that the number of them is an actual infinite.[15]
(5$_5$) An infinite temporal regress of events entails that there are past-tensed truths such that the number of them is an actual infinite.

Here, then, are the relevant interpretations of (8) that must also be considered:

(8$_4$) An infinite temporal progress of events entails that there will be future events such that the number of them is an actual infinite.
(8$_5$) An infinite temporal progress of events entails that there are future-tensed truths such that the number of them is an actual infinite.

An advantage of (5_4) and (5_5) is that they avoid being automatically false, as it were, given the truth of presentism. Now, before assessing (5_4) and (5_5), I will first assess whether (8_4) and (8_5) are in fact false given (i)-(v).

Perhaps Craig can succeed in demonstrating that (8_4) is false given assumptions (i)-(v) in the following manner. Just because it is true that, say, I will freely sit at time t_{future}, it doesn't follow that in an endless universe there is a number of future-tensed truths, such that the number of them is an actual infinite. For, while God has knowledge of the fully determinate future, God's knowledge is non-propositional. Moreover, since Platonism about propositions is false, the number of future events that will occur that *we* can come to have knowledge of is at best a potential infinite. As a result, we should conclude that an infinite temporal progress of events entails that there will be future events such that the number of them is none.

Let's grant for the sake of argument that assumptions (i)-(v) render (8_4) false in the manner just described. The difficulty for Craig is that this line of reasoning similarly undermines (5_4). Just because it is true that, say, I freely sat at time t_{past}, it doesn't follow that in a beginningless universe there is a number of past-tensed truths, such that the number of them is an actual infinite. For, while God has knowledge of the fully determinate past, God's knowledge is non-propositional. Moreover, since Platonism about propositions is false, the number of past events that did occur that *we* can come to have knowledge of is at best a potential infinite. As a result, we should conclude that an infinite temporal regress of events entails that there were past events such that the number of them is none. So, given (i)-(v), Craig cannot establish that (5_4) is true but that (8_4) is false.

One final difference between the past and the future to which Craig might appeal in order to accept (5_4) and deny (8_4) is that the past is fixed and beyond our control whereas the future is not fixed in some sense that is consistent with the full determinacy of the future. It is, after all, intuitive to suppose that our freedom is freedom to add to the given past (Ginet 1990: 102-103). While I am willing to accept this difference between the past and the future for the sake of argument, the problem once again is that I fail to see how this difference is *relevant.* Even if the future is not fixed in some way that is independent of the future's being fully determinate, and (5_4) is in fact true, then all this would show is that, unlike the past, the future may contain a number of events that are up to beings with free will, such that the number of these events is finite *or* an actual infinite.

As a final resort, Craig may attempt to argue that assumptions (i)-(v) show that (5_5) is true, but that (8_5) is false. But this attempt will fail for similar reasons. While God has knowledge of the fully determinate past and the fully determinate future, God's knowledge is non-propositional. Moreover, since Platonism about propositions is false, the number of past-tensed truths and the number of future-tensed truths, respectively, in a beginningless and endless universe is at best a mere potential infinite as opposed to an actual infinite.[16] I thus conclude that under none of the above interpretations of (5) and (8) is it the case that assumptions (i)-(v) render (5) true and (8) false. It thus appears that the *Actuality-Infinity Principle* is crucial for rebutting *Morriston's Objection* which I will now evaluate.

5 The Actuality-Infinity Principle

Recall that according to the *Actuality-Infinity Principle,* in order for x to be actually infinite in quantity, x must be actual. What reason is there to accept this principle? One might be tempted to quickly point out the similarity between the words 'actual' and 'actually'. But we need to be careful here; *even if* the *Actuality-Infinity Principle* is true, it is not part of the *meaning* of 'actual infinite' that it is true, at least not under Craig's atypical understanding of actuality. Perhaps Craig wishes to rely upon some more general principle such as the following:

> ***The Actuality-Number Principle:*** In order for x to have a determinate number of things, x must be actual.

Unfortunately, *The Actuality-Number Principle* is patently false. Suppose that God decrees right now that Gabriel and Uriah are to praise God only four times each, and no more. In that case, the total number of future praises by Gabriel and Uriah combined is eight. Since these eight future praises are not actual (at least not yet) given Craig's position on actuality, we have a counterexample to *The Actuality-Number Principle.*

What other reason, then, is there to accept the *Actuality-Infinity Principle*? I cannot think of one. At any rate, I don't see any remarks by Craig that give us any reason to accept this principle. Indeed, I don't think this principle is even *prima facie* plausible.[17] After all, Craig agrees that if a beginningless universe is metaphysically possible, then it is metaphysically possible for the number of past events to be an actual infinite (as opposed to none). Moreover, in light of the above counterexample to *The Actuality-Number Principle,* we saw that it is metaphysically possible for there to be a *finite* number of future events, despite the fact that such events are not actual (according to Craig's understanding of actuality). So, if an endless universe is metaphysically possible, why isn't it metaphysically possible for there to be an actual infinite number of future events (rather than the number of such events being none)? I see no adequate explanation for such a position. Hence, unless Craig offers us some reason for accepting *The Actuality-Infinity Principle*—a principle to which Craig seems to implicitly appeal in response to *Morriston's Objection*—I contend that Craig is not entitled to affirm this principle within the dialectic concerning (6).

Perhaps the defender of (6) can sidestep *Morriston's Objection* (and thus avoid a commitment to *The Actuality-Infinity Principle*) by offering an alternative philosophical case for (6) which in turn does not support (7). It is to such alternatives that I now turn.

6 An Alternative Route to (6): Implications of a Beginningless Past

Alexander Pruss (2009) and Andrew Loke (2014) have each independently offered a similar alternative route to (6) which, at a first glance, seems to bypass the criticism of Morriston

and Hedrick that, given presentism, it is false that there *are* an actual infinite number of past events.[18, 19] The crucial premise that both Pruss and Loke defend is as follows:

9. If (6) is false, then Hilbert's Hotel is metaphysically possible.

In support of (9), consider Loke's (2014: 48) remarks:

> [T]here exists a 'hotel room builder' who has been building hotel rooms at regular time intervals as long as time exists. Suppose there also exists a 'customer generator' which has been generating customers who checked in the hotel at regular time intervals as long as time exists. Suppose that the hotel rooms and the customers continue existing after they have been built and generated respectively. Now if the actual world is one in which the universe is past-eternal, then there would have been an actual infinite number of time intervals, and an actual infinite number of hotel rooms and customers occupying the rooms. In other words, if the actual world were one in which the universe is past-eternal, then there would be a world in which an actually infinite number of things have been actualized.

By motivating (9) in the above manner, Loke and Pruss can not only grant that there are no past events given presentism; they can also apparently sidestep *Morriston's Objection* since a universe that is endless (but not beginningless) cannot give rise to Hilbert's Hotel through a successive addition of hotel rooms. In other words, the above motivation for (9) apparently does not similarly support the following:

10. If (7) is false, then Hilbert's Hotel is metaphysically possible.

I will now argue, however, that the theist who accepts (9) should similarly accept (10). I suggest that the intuitive force behind (9) stems from something like the following principle:

(a) For any object *0* that comes into existence at some past time, it is possible for *0* to exist at the present time.

Now, the theist who affirms God's omnipotence is arguably committed to the following:

(b) For any object *0* that comes into existence at some past time or future time, God can bring about the existence of *0* at the present time.[20]

While (a) and (b) are certainly quite different claims, I think the theist should nevertheless assign an equal degree of credence to both propositions (at least if one affirms God's existence and omnipotence). In that case, consider a scenario just like the one Loke offers, except that when a hotel room and customer come into existence, they immediately go out of existence at the next moment of time. Does this mean that at the present moment there is not an actual infinite number of occupied hotel rooms? Not necessarily. Given the truth of (b), for every occupied room that did momentarily

exist, God can bring it about that each such hotel room exists now. Perhaps God simply declares, 'let every occupied hotel room that did exist come into being now'. This implies that, if (6) is false, God can instantaneously bring about an actual infinite number of hotel rooms. I will now explain how the truth of (b) is relevant to the discussion at hand.

Consider a universe U that has a beginning but no end. Moreover, suppose that in one thousand years from now in U, a hotel room builder and customer generator will begin to bring about an occupied hotel room for every minute without end. It is certainly true that at no point in time will an actual infinite number of hotel rooms be built. However, given (b), if God exists in U, God can simply declare 'let every occupied hotel room that *will* be built at some time later than one thousand years from now come into being now for one year', and thus instantaneously bring about an actual infinite number of occupied hotel rooms (for one year).[21] So I conclude that, under the assumption that we assign an equal degree of credence to (a) and (b), the theist who accepts (9) given (a) should also accept (10) given (b). Hence, I contend that, just like *AIAI,* this alternative argument for (6) does not escape *Morriston's Objection.*[22]

7 An Alternative Route to (6): The Grim Reaper Paradox

Yet a further argument for the impossibility of a beginningless past is proposed by Koons (2014). Koons employs two versions of the *Grim Reaper* (*GR*) *Paradox* (Benardete 1964), whereby each version is meant to establish a different conclusion. The basic idea behind what I will call the *GR-1 Paradox* is that we are to imagine an actual infinite number of Reapers, each of which are assigned a unique time to kill Fred instantaneously if Fred is alive at that time. Fred is alive at noon. Additionally, each Reaper number *n*'s designated time is 1/2*n* of one minute after noon. The *GR-1 Paradox* seems to entail that some Reaper kills Fred (because by 12:01 pm Fred's death is guaranteed), and that no Reaper kills Fred (because for each Reaper one considers, there is yet a *prior* Reaper that guarantees Fred's death). Koons (2014: 256-260) thereby concludes that it is metaphysically impossible for there to be a region of time that has infinitely many temporally extended parts, whereby that region of time is metrically bounded in the past.[23] I don't wish to dispute the conclusion of this argument. Rather my concern is with the implications of Koons' latter argument, to which I now turn.

The basic idea behind what I will call the *GR-2 Paradox* is that we are to imagine a beginningless past, such that for each moment of time in the past there is a unique Grim Reaper who is to issue a death warrant at that time *iff* no previous Reaper has issued a death warrant. The *GR-2 Paradox* similarly results in a contradiction. Koons (2014: 260) says that we should escape this contradiction by affirming (6).[24] The concern I have for this argument is that I think it similarly faces *Morriston's Objection,* at least given certain assumptions (to be discussed below).

Suppose universe U has a beginning but no end. Every time *t* in U is paired with a unique Grim Reaper whose task is to swing their scythe at *t iff* no Reaper swings their scythe at t^*, such that t^* is posterior to *t.* Call this the *Future Grim Reaper* (*FGR*) *Paradox.* I will now show that this paradox results in a contradiction.

Consider Reaper$_1$ whose task is to swing their scythe at t_1 (the first moment of time in U) *iff* no Reaper swings their scythe at any time after t_1. Suppose Reaper$_1$ swings their scythe at t_1. In that case, no Reaper swings their scythe at any time after t_1. *A fortiori,* Reaper$_2$ does not swing their scythe at t_2. But if Reaper$_2$ does not swing their scythe at t_2, this implies that some Reaper swings their scythe at some time after t_2. *A fortiori,* some Reaper swings their scythe at some time after t_1. We have thus arrived at the contradictory conclusion that it is both true and false that some Reaper swings their scythe at some time after t_1. Now, let's suppose instead that Reaper$_1$ does not swing their scythe at t_1. In that case, there is some Reaper that swings their scythe at some time after t_1. Let's arbitrarily suppose that Reaper swings their scythe at t_5.[25] In that case, no Reaper swings their scythe at any time after t_5. *A fortiori,* Reaper$_6$ does not swing their scythe at t_6. But if Reaper$_6$ does not swing their scythe at t_6, then some Reaper swings their scythe at some time after t_6. *A fortiori,* some Reaper swings their scythe at some time after t_5. We have once again arrived at a contradiction: it is both true and false that some Reaper swings their scythe at some time after t_5. So the *FGR Paradox* results in a contradiction. Hence, if the *GR-2 Paradox* shows that (6) is true, then the *FGR Paradox* shows that (7) is true.[26]

Koons (2014: 264-265) claims that we cannot similarly show that an endless future is metaphysically impossible by appealing to some sort of *GR Paradox*:

> The only way to construct the Grim Reaper paradox in reverse would be to stipulate that each Reaper is able to check whether or not Fred will be alive at the end of his appointed period, and to kill him if he will, which doesn't make any sense. The apparent connections between time, knowledge and action all seem to rule out the possibility of such a paradox, without providing any grounds for rejecting hypotheses concerning the endlessness of time.

Notice, however, that Koons only considers a future-oriented paradox whereby what a Reaper does is defined in terms of whether or not Fred is alive at (and after) the Reaper's designated time. However, as we have seen, my *FGR Paradox*—like the *GR-2 Paradox* Koons employs in support of (6)—is such that what a Reaper does is sensitive to what other Reapers do, rather than being sensitive to whether or not Fred is alive at some time. For, regarding the *GR-2 Paradox,* Koons (2014: 260) considers a 'Grim Placer [a kind of Reaper], who [in order to issue a death warrant] creates a particle and places it at a designated spot, if and only if no particle is already located at a spot corresponding to any earlier Placer'; according to my *FGR Paradox,* a Reaper swings their scythe *iff* no Reaper swings their scythe at some later time.

Admittedly, as Koons emphasizes (personal correspondence), in the *GR-2 Paradox* each Reaper has a certain causal sensitivity to what past Reapers have done. Moreover, Koons rejects the possibility of a Reaper having causal sensitivity to future events, at least as a basic capacity. In response, I am willing to concede for the sake of argument that it is impossible for a Reaper to have a *basic* capacity to be sensitive (causally or otherwise) to future events. However, a theist such as Craig who affirms God's omniscience and the future's full determinacy apparently cannot rule out the

possibility of God communicating to Reaper$_1$ of the *FGR Paradox* as to whether or not some Reaper will swing their scythe at some time after t_1.[27]

In response to this consideration, Koons maintains (personal correspondence) that it is metaphysically impossible for God to create creatures who embody God's omniscience. My rebuttal is twofold. First, Reaper$_1$'s knowledge of whether some future Reaper will swing their scythe (i.e., knowing the truth of *one* proposition) is consistent with the metaphysical impossibility of Reaper$_1$ being omniscient. Second, perhaps Koons' position is motivated by the apparent metaphysical impossibility of causal loops. However, according to the *FGR Paradox,* what Reaper$_{n+1}$ does is in no way dependent upon what Reaper$_1$ does. Rather, what each Reaper does only depends upon what future Reapers do. Hence, God's communicating to Reaper$_1$ as to whether some future Reaper will swing their scythe arguably does not involve a causal loop.

Can Koons modify the *GR-2 Paradox* in such a way that what each Reaper does is defined in terms of whether or not Fred is alive at that Reaper's designated time? Apparently not. If, in a beginningless past, at the designated time of each Reaper, that Reaper issues a death warrant *iff* Fred is alive at that time, then we can consistently maintain that there is no time at which Fred is alive, and thus no Reaper issues a death warrant. Hence, no contradiction arises. If what each Reaper does is defined in terms of whether Fred is alive at that Reaper's designated time, a contradiction arises *only* in the *GR-1 Paradox,* i.e., a case in which we suppose that there is a time at which Fred is alive, such that that time is *prior* to an actual infinite number times, each of which are designated to some unique Reaper.

To be clear, I do not take myself to have conclusively shown that Koons' argument for (6) succumbs to *Morriston's Objection.* Rather, the main point I wish to make is that, given Craig's commitment to God's foreknowledge of a fully determinate future, it is far from obvious that Craig can employ a *GR Paradox* to argue for (6) without succumbing to *Morriston's Objection.*

8 Conclusion

Craig cannot successfully rebut *Morriston's Objection* without the *Actuality-Infinity Principle.*[28] However, the *Actuality-Infinity Principle* remains unmotivated, and is not even *prima facie* plausible, or so I have suggested. Morriston may take tense seriously insofar as he may grant Craig the assumption that, unlike the future, the past and the present are parts of the actual world. However, Morriston should not grant Craig the *Actuality-Infinity Principle,* at least not until further notice. Additionally, we have seen that, despite initial appearances, alternative arguments for (6) by Pruss, Loke, and Koons seem to similarly succumb to *Morriston's Objection.* At any rate, I have suggested that Koons' argument for (6) succumbs to *Morriston's Objection* if, like Craig, one affirms God's foreknowledge of a fully determinate future. Perhaps, then, Craig should ultimately bite the bullet and accept (7). Alternatively, perhaps Craig is better off relying solely upon the empirical evidence for (2). Regardless, it is safe to say that

the apparent metaphysical possibility of an endless future remains an obstacle for the *a priori* case for the universe's beginning.[29]

Notes

1 For a recent, extensive defense of the *KCA,* see Craig and Sinclair (2009).

2 Morriston (2010: 450; 2012: 450) is clear that his main aim is *not* to establish that an endless series of pre-determined events is an actual infinite. Instead Morriston's main aim is to show that Craig's argument against the possibility of a beginningless past results in an equally good argument against the possibility of a pre-determined, endless future. I agree with Morriston that affirming that *only* an infinite temporal regress of past events is an actual infinite is not *sufficient* for rebutting *Morriston's Objection*. However, affirming such a position is surely a *necessary* condition for rebutting *Morriston's Objection*. And, as I intend to show, Craig has not successfully secured this necessary condition.

3 In response to the question 'How many praises will be said?' Craig (2010: 454) says 'Potentially infinitely many'. It is unclear how these two questions are different to the extent that they warrant different answers. Regardless, it is the earlier question that is of interest since, as Morriston (2012: 445) rightly notes, the number of future praises is not growing, and thus is not a potential infinite. Rather, it is only the number of praises that *have been* uttered that is a potential infinite. In fact, the number of future praises that will be uttered is, in a sense, *decreasing* given the passage of time, despite the fact that Uriah and Gabriel will never cease to utter praises.

4 Interestingly, Al-Ghazali (2000: 47-48/Discussion 2, sect. 4) himself rejects (7), and apparently for reasons not too dissimilar to those of Craig when Al-Ghazali (2000: 48) says that 'the future does not enter at all into existence, either successively or concomitantly, whereas all of the past has entered into existence successively, even though not concomitantly.'

5 See, e.g., Adams (1974) and Plantinga (1974).

6 I understand the future to be fully determinate only if, for any future-tensed proposition *p*:

> *p* is either true or false. [Law of bivalence]
>
> If *p* is false, the negation of *p* is true. And, if *p* is true, the negation of *p* is false. [Law of excluded middle]

There are, in fact, reasons to think that these conditions are necessary but not sufficient for the future's being fully determinate. But delving into this matter takes us too far afield, and doesn't affect what I wish to argue for in this paper. See Todd (Forthcoming).

7 For further elaboration of the moving spotlight view, see Zimmerman (2005).

8 While modal realists deny that if x exists then x is actual, I assume that Craig does not want his reply to *Morriston's Objection* to depend upon the truth of modal realism.

9 Craig explicitly defends presentism in his (2003). Moreover, Craig emphasizes the soundness of *AIAI* given the truth of presentism in Craig and Sinclair (2009: 16) and Craig (2010: 456).

10 I assume that Craig understands the predicate 'is actual' to be identical to, or at least necessarily co-extensive with, the predicate 'is part of reality'.

11 Although Morriston's appeal to an endless series of *pre-determined* events has the advantage of supplying a truthmaker within the present (and thus, the actual) for the alleged truth that the number of praises that will be uttered is an actual infinite, we need not get bogged down for our purposes with issues about truthmaking since, as previously noted, Craig (1990) himself seems to accept that the future is fully determinate.

12 To be clear, I am presupposing something akin to a Neo-Quinean framework about existence in comparison to, say, a Meinongian framework. This presupposition is, of course, a fairly standard one.

13 It is worth noting that Hedrick raises a number of further important objections to *AIAI* which are largely independent of *Morriston's Objection,* and which I lack the space to discuss here.

14 While many have thought that A-theorists are rationally committed to Prior's primitive tense operators since they are indispensable to formulation of the A-theory, Meghan Sullivan (2011: ch. 4) has recently suggested that A-theorists can in fact give up tense operators in exchange for predicate modifiers. A sizable amount of space would be required to flesh out Sullivan's novel proposal. However, it is, I think, safe to assume that interpreting (5) and (8) with the aid of predicate modifiers will not render the verdict that (5) is true but (8) is false given assumptions (i)-(v) alone. The reason for this is similar to the reasons given for thinking that, given assumptions (i)-(v) alone, Craig cannot consistently affirm (5_1), (5_2), or (5_3) without also affirming (8_1), (8_2), or (8_3).

15 I do not know how we would capture the meaning of (5_4) or (8_4) by employing Prior's tense operators. To illustrate, we can preserve the truth value of 'there were dinosaurs' by translating this sentence to '*P*(there are dinosaurs)'. However, at least given the truth of presentism, we cannot preserve the truth value of 'there were past events' by translating this sentence to '*P*(there are past events)' since the former sentence is clearly true but the latter sentence is false. *Mutatis mutandis* for 'there will be future events'. Regardless, I will charitably assume that, even given the truth of presentism, 'there were past events' is possibly true, and that 'there will be future events' is possibly true.

16 Craig would presumably want to say that on his preferred anti-Platonist view of propositions, at least one condition under which the number of truths is a potential infinite is one in which beings like us continue to gain knowledge (i.e., come to know more true non-fundamental propositions, sentences, etc.) without end.

17 Note that I am not making the stronger claim that the *Actuality-Infinity Principle* is implausible. Nor do I need to make this stronger claim since the burden is on Craig to show us that the *Actuality-Infinity Principle* is more plausible than its negation as a first step towards rebutting *Morriston's Objection.*

18 Note that only Loke is explicitly responding to Hedrick. Additionally, it is worth noting that Pruss' current position is that there is no problem with an infinite past *per se,* but that there is a problem with infinitely many things causally influencing one thing (personal correspondence).

19 Thanks to Bill Craig and Alex Pruss for pointing out to me that this kind of argument for (6) in fact traces back to Al-Ghazali, and is discussed by Aquinas in *Summa Contra Gentiles,* II. 81.9. Specifically, the argument appears in Al-Ghazali (2000: 19/ Discussion 1, sections 28-30).

20 Let's bracket off such objects as a rock that is too heavy for God to lift, or certain objects such that it is morally impermissible for God to bring about (if there are any), and any other anomaly that is irrelevant to the argument at hand.

21 I specified that God brings about these hotel rooms for just one year in order to avoid intricate issues concerning the same hotel room being multiply located. Another way to avoid issues concerning being multiply located is by stipulating that God declares instead, 'for every occupied hotel room that will be built at some time later than one thousand years from now, let there exist now a unique duplicate of that room'.

22 Notice that if time travel is possible, then the metaphysical possibility of an endless future seems to similarly imply the metaphysical possibility of Hilbert's Hotel given the following principle:

> **(c)** For any object *0* that comes into existence at some future time, it is possible for *0* to travel to the present time.

Craig (1990: 150-157) in fact rejects the metaphysical possibility of time travel since, given his commitment to A-theory, Craig rejects the metaphysical possibility of backward causation. Assessing Craig's position unfortunately takes us too far afield. I only wish to note, however, that there is a surprisingly strong case to be made for the compossibility of presentism (Craig's preferred view) and time travel; see Keller and Nelson (2001) and Hall (2014).

23 The more specific thesis Koons (2014: 259) argues against is the following:

> **Possibility of Bounded and Non-Well-Founded Time Sequence (BNWF):** There is a possible world W and a spatiotemporal region R in W such that (i) there is a time t within R and a finite temporal interval d such that no part of R begins earlier than d before t, and (ii) R has infinitely many temporally extended parts such that these parts can be put into a sequence (ordered by the natural numbers) in which each successive part in the sequence is wholly earlier in time than its predecessor.

24 The more specific thesis Koons (2014: 260) argues against is the following:

> **Possible Infinite Past, with Infinitely Many Parts (PIPIP):** There is a possible world W and a region R and time t of W such [*sic*] R has a temporal part wholly earlier than d units before t, for every finite interval d.

25 Perhaps one could maintain that while some Reaper will swing their scythe at some time after t_1, it is indeterminate which Reaper will do so. This consideration should be taken seriously. Unfortunately, however, since Craig (1990) affirms the full determinacy of the future, this does not appear to be a position Craig can entertain. Thanks to Matt Eller for this suggestion.

26 Thanks to Travis Timmerman for a lengthy discussion of the *FGR Paradox.*

27 A number of theists—such as Merricks (2009: 54-55) and Craig (1990) himself—hold that God's exhaustive foreknowledge of a fully determinate future need not involve backward causation. Moreover, God's communicating some truth to a Reaper doesn't seem to require backward causation either. Hence, someone like Craig should not object to the *FGR Paradox* on the grounds that it must involve backward causation.

28 To repeat my earlier remark in footnote 2, affirming that *only* an infinite temporal regress of past events is an actual infinite is not *sufficient* for rebutting *Morriston's Objection.* However, affirming such a position is surely a *necessary* condition for rebutting *Morriston's Objection.* And, as I have tried to show, Craig has not successfully

secured this necessary condition since he has not offered us any reason to accept the *Actuality-Infinity Principle.*

29 For helpful feedback on a previous draft of this paper, I am grateful to Matt Eller, Mark Heller, Rob Koons, Wes Morriston, Alex Pruss, and Travis Timmerman.

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18

The *Kalām* Cosmological Argument

William Lane Craig

Introduction

The *kalām* cosmological argument, largely forgotten since the time of Kant, finds nary a mention in Plantinga's "Two Dozen (or so) Theistic Arguments." Indeed, "benign neglect" best describes Plantinga's treatment of the argument throughout the corpus of his work. Neither supported nor refuted, the argument simply goes almost entirely unremarked. So its inclusion in the present volume can be justified only by taking it to be among the unnamed arguments in the catch-all category "or so."

My attempt to resurrect the *kalām* cosmological argument in 1979 was initially no more successful than Stuart Hackett's similar attempt two decades earlier.[1] Today, however, the argument is once again in the spotlight.[2] In a recent philosophical appraisal, the author judges that the argument's proponents have battled its critics to a stalemate,[3] a result with which I as a natural theologian am entirely content. In this brief essay, I want to reflect on some current developments regarding the argument.

The medieval Muslim theologian al-Ghazali presented the following simple statement of the argument: "Every being which begins has a cause for its beginning; now the world is a being which begins; therefore, it possesses a cause for its beginning."[4]

We shouldn't stumble at Ghazali's deductive formulation of the argument. The evidence needn't render a deductive argument's premises certain in order for the argument to be cogent. But if one prefers, the argument can be formulated inductively as an inference to the best explanation. I myself like to present the argument deductively because of the clarity and simplicity of such a formulation.

First Premise

Ghazali's first premise, "Every being which begins has a cause for its beginning," raises a number of questions which limitations of space preclude my discussing. Suffice it to say that I now prefer to reformulate the causal premise: "If the universe began to exist, then the universe has a cause of its beginning."

The most important objection to the causal premise comes from Adolf Grünbaum, who points out that it assumes that in beginning to exist, the universe came into being.[5]

The issue Grünbaum raises here is whether time is tensed or tenseless. On a tensed or so-called A-theory of time temporal becoming is an objective feature of reality, whereas on a tenseless or B-theory of time, all events are equally real and temporal becoming an illusion. On a B-theory the universe in beginning to exist does not come into being; rather the tenselessly existing 4-dimensional spacetime manifold simply has a front edge, so to speak. I should say that a tensed theory of time is a sufficient, though not a necessary, condition for the truth of the premise because something cannot come into being from nothing. I have therefore tried to do my philosophical duty by writing a two-volume defense of a tensed as opposed to tenseless theory of time.[6]

Second Premise

Let's hurry on to the argument's crucial second premise, "The universe began to exist." I've defended two philosophical arguments and two scientific confirmations for this premise. We shall focus here on the philosophical arguments.

First Philosophical Argument

I argue:

1. An actual infinite cannot exist.
2. An infinite temporal regress of events is an actual infinite.
3. Therefore an infinite temporal regress of events cannot exist.

Against (1) it has been objected that the same arguments against the existence of an actually infinite number of concrete objects would apply *mutatis mutandis* to abstract objects, which would destroy classical mathematics. One might respond to this objection by drawing some in principle distinction that would exempt *abstracta* from the argument. For example, Alexander Pruss and Robert Koons (to be discussed in the sequel) hold that arguments against the actual infinite apply only to causally connected things, thereby exempting *abstracta* from their strictures. This would be a welcome conclusion, indeed, since arguments against an actually infinite regress of concrete things would not imply finitism about abstract objects. But assuming a worst case scenario, would finitism about *abstracta* destroy classical mathematics?

This allegation is far too hasty. It begs the question against anti-realist views of mathematical objects. The truth of classical mathematics and the ontology of mathematical objects are distinct questions, all too often conflated by recent critics of the argument.[7] Most anti-realists would not go to the intuitionistic extreme of denying mathematical legitimacy to the actual infinite; rather they would simply insist that acceptance of the mathematical legitimacy of certain notions does not imply an ontological commitment to the reality of various objects. The abundance of nominalist (or anti-realist) alternatives to Platonism (such as neutralism, fictionalism,

constructiblism, figuralism, modal structuralism, pretense theory, and so on) renders the issue of the ontological status of mathematical entities a moot question. The realist, then, if he is to maintain that mathematical objects furnish a decisive counterexample to the denial of the existence of the actual infinite, must provide some overriding argument for the reality of mathematical objects, as well as provide rebutting defeaters of all the anti-realist alternatives consistent with classical mathematics—a task whose prospects for success are dim, indeed.[8]

It is sometimes asserted that science requires that an actually infinite number of things exist. But this is in fact false. The notion of the potential infinite is entirely adequate to scientific theorizing. Stanford University mathematician Solomon Feferman, commenting that "the actual infinite is not required for the mathematics of the physical world," explains,

> Infinitary concepts are not essential to the mathematization of science, all appearances to the contrary. And this . . . puts into question the view that higher mathematics is somehow embodied in the world, rather than that it is the conceptual edifice raised by mankind in order to make sense of the world.[9]

The best way to support (1) is by way of thought experiments which illustrate the various absurdities that would result if an actual infinite were to be instantiated in the real world, for example, the famous "Hilbert's Hotel," which is able to accommodate infinitely more guests despite its being fully occupied. José Benardete, who is especially creative and effective at concocting such thought experiments, puts it well: "Viewed *in abstracto*, there is no logical contradiction involved in any of these enormities; but we have only to confront them *in concreto* for their outrageous absurdity to strike us full in the face."[10]

Benardete has especially in mind what he calls paradoxes of the serrated continuum, such as the following:

> Here is a book lying on the table. Open it. Look at the first page. Measure its thickness. It is very thick indeed for a single sheet of paper—1/2 inch thick. Now turn to the second page of the book. How thick is this second sheet of paper? 1/4 inch thick. And the third page of the book, how thick is this third sheet of paper? 1/8 inch thick, &c. *ad infinitum*. We are to posit not only that each page of the book is followed by an immediate successor the thickness of which is one-half that of the immediately preceding page but also (and this is not unimportant) that each page is separated from page 1 by a finite number of pages. These two conditions are logically compatible: there is no certifiable contradiction in their joint assertion. But they mutually entail that there is no last page in the book. Close the book. Turn it over so that the front cover of the book is now lying face down upon the table. Now—slowly—lift the back cover of the book with the aim of exposing to view the stack of pages lying beneath it. *There is nothing to see*. For there is no last page in the book to meet our gaze.[11]

What makes paradoxes like these especially powerful is that no process or supertask is involved here; each page is an actual entity having a finite thickness (none is a

degenerate interval) which could be unbound from the others and all the pages scattered to the four winds, so that an actual infinity of pages would exist throughout space. If such a book cannot exist, therefore, neither can an actual infinite.

At this point the actual infinitist has little choice but, in Oppy's words, simply to "embrace the conclusion of one's opponent's *reductio ad absurdum* argument." Oppy explains, "these allegedly absurd situations are just what one ought to expect if there were . . . physical infinities."[12]

Oppy's response, however, is unavailing: it does nothing to prove that the envisioned situations are not absurd but only serves to reiterate, in effect, that if an actual infinite could exist in reality, then there could be Benardete's Book or Hilbert's Hotel, which is not in dispute. The problem cases would, after all, not be problematic if the alleged consequences would not ensue! Rather the question is whether these consequences really are absurd.

With respect to premise (2), there has been considerable discussion in recent years whether the argument would, if successful, imply the finitude of the future as well as the finitude of the past.[13] The point of this misgiving is not altogether clear. Since the traditional proponents of the *kalām* cosmological argument believed in life everlasting, this sort of consideration might give the argument's critic a dialectical advantage when directed *ad hominem*; but it neither undercuts nor rebuts either of the premises of the argument against the infinitude of the past. Physical eschatology is perfectly consistent with the temporal series of events' coming to an end in a terminal cosmological singularity. Philosophical arguments in favor of the temporal series of events' coming to an end would occasion serious theological difficulties for orthodox Christians, Jews, and Muslims, but they would constitute no defeater of the argument for the finitude of the past.

Cohen interprets the argument's critics to hold that since an endless universe certainly seems possible, we should be sceptical of the arguments for the beginning of the universe. The proponent of the *kalām* argument could shrug this claim off by responding that the critic has shown no absurdity in the series of events' having an end as well as a beginning. So the scepticism is groundless.

But is the critic warranted in treating past and future events as completely parallel? Defenders of the *kalām* argument may attempt to defeat the objection by drawing attention to some crucial disanalogy between the past and future which spoils the critics' attempt to demonstrate parallelism. On a tenseless or B-theory of time, the future is entirely analogous to the past, since all events are equally real and temporal becoming an illusion. On a B-theory of time it is perspicuous why arguments against a beginningless series of earlier events would be equally good arguments against an endless series of later events.

But the *kalām* cosmological argument presupposes from start to finish a tensed or A-theory of time according to which temporal becoming is an objective feature of reality. The series of events terminates in the present event, and the terminus is constantly changing as new events occur and are added to the series. There are no events later than the present event and, hence, no future events. So an A-theory of time entails that an actually infinite number of future events does not exist; indeed,

the number of future events is 0. The series of events later than any event in time is always finite and always increasing toward infinity as a limit. In other words, such a series is potentially infinite. This feature of the series elucidates why it seems intuitively obvious that the temporal series of events could go on forever: it endlessly approaches infinity as a limit. By contrast the series of events earlier than any event in time cannot be potentially infinite, for in order to be so, it would have to be finite and yet increasing in the *earlier than* direction, which contradicts the nature of temporal becoming. So a beginningless series of such events must be actually infinite.

Cohen insists that in order to rebut the objection, it is not enough to affirm that only the series of past events, in contrast to the series of future events, is actually infinite. Two points should be made here. First, the proponent of the *kalām* argument need not *rebut* the objection in order to defeat it. He may defeat it by simply *undercutting* the warrant for the objection. It is the objector who has in this case a fairly heavy burden of proof to bear: he needs to prove that arguments for the finitude of the past translate unproblematically into arguments for the finitude of the future.[14] Second, if the argument against the infinitude of the past is based on the paradoxical nature of the actual infinite, then affirming that a beginningless series of past events, in contrast to an endless series of future events, is alone actually infinite does, indeed, provide a defeater of the objection. The objector will have the burden of showing that such an affirmation is untenable.

It has been said that on presentism, past events no more exist than future events, so that the number of past events is likewise 0, even if the series of past events is beginningless.[15] But as I have made clear, my argument against the existence of an actual infinite is intended to show that an actually infinite number of things cannot be instantiated in reality.[16] Given an A-theory of time, if the series of isochronous events is beginningless, then an actually infinite number of past events has been instantiated in reality. By contrast if the series of isochronous events is endless, an actually infinite number of future events has not and never will be instantiated in reality. *Pace* Cohen, while an infinite temporal regress of events entails that an actually infinite number of (past) events has occurred, an infinite temporal progress of events does not entail that an actually infinite number of (future) events will occur.[17] There never will occur an actually infinite number of events, since it is impossible to count to infinity. The only sense in which there will be an infinite number of events is that the series of events will increase toward infinity as a limit. Therefore, it is not the case, as Hedrick claims,[18] that the events in an endless future can be put into a 1-1 correlation with the events in an endless past, for the number of future events is 0, while the number of past events is *ex hypothesi* $\aleph_0$.

Hedrick also expresses the reservation that "To claim that the same absurdity [as Hilbert's Hotel] can be generated with an actually infinite number of non-existing things like past events makes it seem like Craig's complaint is with the mathematical legitimacy of infinity, not just the idea that the actual infinite is instantiated in reality."[19] I plead not guilty. As an anti-realist about mathematical objects, I take a pretense theoretical approach to set theory.[20] We are invited to imagine its axioms, in particular the Axiom of Infinity, to be true and then are free to explore the consequences. Within

that make-believe realm, we may discourse consistently about actual infinites without any metaphysical qualms of conscience. By contrast past events are not mere fictions but have actually occurred and so are part of the actual world.

Hedrick offers a congenial reformulation of my argument based on the impossibility of an actual infinite as follows:

(D1) There cannot be a world in which an actually infinite number of things have been actualized.
(D2) If the actual world is one in which the universe is past-eternal, then there is a world in which an actually infinite number of things have been actualized.
(D3) Therefore, the actual world cannot be one in which the universe is past-eternal.[21]

Although Hedrick is dubious as to the relevance of absurdities like Hilbert's Hotel to (D1), it seems to me that the above reformulation removes any objection to the illustrative use of Hilbert's Hotel based on the non-simultaneity of the entities being numbered, so long as those entities have—like past events and in contrast to future events—been actualized.

In fact, as Andrew Loke shows, if one denies (D1) on the basis of the possibility of an infinite temporal regress of events, then it is unproblematic to show that a simultaneously existing actually infinite number of things can exist.[22] He imagines that the infinite regress of events comprises events involving the construction of hotel rooms and the generation of customers from eternity past. By the present time we shall have a hotel with an actually infinite number of rooms and an actually infinite number of residents. By contrast, if the construction of such a hotel were to commence at the present time, then it would never have an actually infinite number of rooms, though the construction go on endlessly toward infinity as a limit. Hence, an endless future does not generate the same absurdities as does an infinite past.

While acknowledging the force of Loke's argument, Cohen insists that a parallel argument can be constructed to show that if an endless series of events is possible, then Hilbert's Hotel is metaphysically possible. Cohen claims that the theist who affirms God's omnipotence is committed to the following:

(b) For any object *o* that comes into existence at some past time or future time, God can bring about the existence of *o* at the present time.

Imagine, then, that at some future time construction begins on a Hilbert's Hotel, one occupied room being built every minute without ceasing. Cohen asserts,

> It is certainly true that at no point in time will an actual infinite number of hotel rooms be built. However, given (b), if God exists. . . , God can simply declare 'let every occupied hotel room that *will* be built come into being now for one year', and thus instantaneously bring about an actual infinite number of occupied hotel rooms (for one year).[23]

Cohen thinks that the theist who affirms that if a beginningless series of events is possible, then Hilbert's Hotel is metaphysically possible should also affirm that if an endless series of events is possible, then Hilbert's Hotel is metaphysically possible.

Again, this objection is curiously *ad hominem*. Only theists are said to be obliged to accept the objection's conclusion. Absent God, Cohen's thought experiment would require backward causation of rooms, which the A-theorist will rightly regard as metaphysically impossible. Loke's thought experiment, by contrast, is based on wholly non-theistic assumptions about things' enduring until the present, not upon miraculous re-creation in the present. Cohen's riposte requires theistic assumptions to get off the ground, assumptions which make the *kalām* cosmological argument superfluous as a piece of natural theology.

But never mind. The more serious failing of Cohen's objection is that it involves an illicit modal operator shift.[24] For from (b) it does not follow that God can bring it about that all future objects *o* exist at the present time. If the future is potentially infinite, it does not follow from God's ability to bring about the present existence of any particular future room that He is able to bring about the present existence of all the future rooms. The number of occupied rooms that God could create at present is potentially infinite, but any number of rooms He actually creates will be finite, as may be seen by taking the number of rooms presently created as a function of the number of rooms that will exist:

$$\lim f(x) = \infty x \to \infty.$$

Thus, Loke is quite justified in denying that the possibility of an endless future implies the possibility of the existence of an actually infinite number of things, as does the possibility of a beginningless past.

Second Philosophical Argument

My second philosophical argument for the beginning of the universe runs:

1. A collection formed by successive addition cannot be an actual infinite.
2. The temporal series of events is a collection formed by successive addition.
3. Therefore, the temporal series of events cannot be an actual infinite.

This version of the *kalām* argument eventually became enshrined in the thesis of Kant's First Antinomy concerning time in his *Critique of Pure Reason*.

I was fascinated to find that Plantinga briefly addresses Kant's argument in *Warranted Christian Belief*.[25] Unfortunately, his verdict on Kant's argument is unfavorable, to put it mildly. He says that Kant's argument "is hard to take seriously." Plantinga explains, "It is not as if it is an argument the premises of which have a certain limited amount of intuitive plausibility; it is rather that this transition to the conclusion completely begs

the question by assuming what was to be proved. . . .” “So the argument really has no force at all.”

Well! Does Kant’s argument really merit this disapprobation? Pay careful attention to Kant’s formulation of the argument:

> If we assume that the world has no beginning in time, then up to every given moment an eternity has elapsed, and there has passed away in the world an infinite series of successive states of things. Now the infinity of a series consists in the fact that it can never be completed through successive synthesis. It thus follows that it is impossible for an infinite world-series to have passed away, and that a beginning of the world is therefore a necessary condition of the world’s existence (A426/B454).

Plantinga paraphrases the second sentence of Kant’s argument as follows: “According to the second premise, . . . it is characteristic of an infinite series that it can’t be completed by starting from the beginning . . . and adding things (events, say) one at a time. . . .”

Plantinga first raises a cavil about this claim by appealing to the possibility of so-called supertasks. He writes, “According to current lore about the infinite, however, there is no bar. . . to completing the infinite series in a finite time if the time taken for each event diminishes appropriately.”

Now I see no reason at all to believe “the current lore about the infinite.” The impossibility of the formation of an actual infinite by successive addition seems to me obvious in the case of beginning at some point and trying to reach infinity. For, necessarily, given any finite number n, n+1 equals a finite number. Hence, $\aleph_0$ has no immediate predecessor; it is not the terminus of the natural number series but stands, as it were, outside it and is the number of all the members in the series. This rules out the possibility of supertasks. The fatal flaw in all such scenarios is that the state at $\omega + 1$ is causally unconnected to the successive states in the ω series of states. Since there is no last term in the ω series, the state of reality at $\omega + 1$ appears mysteriously from nowhere. The absurdity of such supertasks merely underlines the metaphysical impossibility of trying to convert a potential into an actual infinite by successive addition.

Moreover, as Plantinga recognizes, this objection is really irrelevant because the series of past events was not formed in the manner of a supertask. The temporal series of past events that the proponent of the *kalām* argument is talking about are events having an arbitrary but constant, nonzero, finite duration. So supertasks don’t even come into the picture.

Rather Plantinga’s real problem with Kant’s argument is that it is question-begging. He writes,

> Kant points out that an infinite series can’t be completed by starting from some point finitely far from the beginning and adding members finitely many at a time at a constant rate. . . . The premise tells us that if you start from some finite point in the series – that is some point finitely far from the *beginning* of the series – and

> add a finite number per unit time, then you will never complete the series. Fair enough; but if the world has existed for an infinite stretch of time, then there was no first moment, no first event, and no beginning either to the series of moments or the series of events; more generally, at any preceding moment an infinite time would *already* have elapsed.

Plantinga claims that Kant's argument "completely begs the question" because it assumes what was to be proved, namely, "that the series in question has a beginning."

Having read the standard refutations of Kant's argument, I have been tempted for many years to write an article entitled, "Was Kant a *Dummkopf*?" Are we seriously to believe that the titan of Königsberg was so stupid that he argued for the beginning of the universe by assuming that the universe had a beginning? Nothing in Kant's argument says or implies that in an infinite series of past events there was an infinitely distant beginning point, much less the incoherent assumption of a point finitely distant from the infinitely distant beginning point, as Plantinga alleges. An infinite series of past years prior to January 1, 2016, for example, is a series without a beginning that is completed on that date. Such a series is of the ordinal type ω^*, the ordinal type of the negative numbers. We can argue about whether Kant was right that such a series cannot be completed by successive synthesis; or about the tensed theory of time that underlay such an argument; but let's not interpret him uncharitably so as to ascribe to him obvious blunders.

Although the problems will be different, the formation of an actually infinite collection by never beginning and ending at some point seems scarcely less difficult than the formation of such a collection by beginning at some point and never ending. If one cannot count *to* infinity, how can one count down *from* infinity? If one cannot traverse the infinite by moving in one direction, how can one traverse it by moving in the opposite direction?

A typical counterexample lodged against (1) is the alleged actual infinity of sub-intervals traversed in the traversal of any finite interval of time or space. The recent defenses of the Grim Reaper Paradox by Pruss and Koons provide, to my mind, convincing reason to think that spatio-temporal intervals are not, in fact, composed of a dense infinity of points or instants.[26] Pruss and Koons invite us to imagine that there are denumerably infinitely many Grim Reapers (whom we may identify as gods, so as to forestall any kinematic objections). You are alive at midnight. Grim Reaper #1 will strike you dead at 1:00 a.m. if you are still alive at that time. Grim Reaper #2 will strike you dead at 12:30 a.m. if you are still alive then. Grim Reaper #3 will strike you dead at 12:15 a.m., and so on. Such a situation seems clearly conceivable—given the possibility of an actually infinite number of sub-intervals of the hour between midnight and 1:00 a.m.—but leads to an impossibility: you cannot survive past midnight, and yet you cannot be killed by any Grim Reaper at any time.

In the traversal of any finite distance, there is thus no completion of an actual infinite by successive addition. Now the implication of the Grim Reaper paradox is that space and time are not continua composed of points or instants.[27] The question, then, is how best to understand the structure of time and space.

We might conceive of time and space as discrete, that is, as a composition of atoms or chronons of a certain non-zero, finite extension. Since the advent of quantum theory, philosophers, and physicists as well, have exhibited much greater openness to taking time and space to be discrete rather than dense. In fact, many think that the continuity of spacetime in General Relativity is what needs to go if we are to have a unified physical theory of the world.[28]

I myself prefer an Aristotelian view according to which time as pure duration is logically prior to our mathematical modeling of it as a geometrical line composed of points or intervals. On such a view, time is potentially infinitely divisible in that we can specify intervals and sub-intervals of time with infinity as a limit (∞), but time is not a composition of an actually infinite number ($\aleph_n$) of instants or intervals.

Stephen Puryear has recently argued that the Aristotelian view is not open to the proponent of the *kalām* cosmological argument. Remarkably, Puryear argues that the Aristotelian view of time as potentially infinitely divisible implies: (1) the number of past events in a beginningless universe can be at most finite, not actually infinite; (2) the number of past events in a beginningless universe is at most potentially, but not actually, infinite; and (3) the series of past events is formed by division, not by successive addition.[29] These conclusions are so evidently absurd that Puryear's argument might justifiably be construed as a *reductio ad absurdum* of the Aristotelian view of time.[30]

I suspect that few philosophers will agree that Aristotelians are committed to such bizarre conclusions. Although Puryear's argument might be challenged at a number of junctures,[31] it seems to me that its central failing involves a misunderstanding inherited by Puryear from Wesley Morriston. Morriston puts the following reply in my mouth: "Any such region is, of course, infinitely divisible—but the 'parts' into which it can be divided are not 'there' until someone (at least in thought) marks them out. And since no one could complete *all* the possible divisions, they are only *potentially* 'there.'"[32] The first sentence accurately captures my Aristotelianism. But the second sentence mistakenly ascribes to me a sort of constructivism according to which actual infinites are impossible because they are humanly non-constructible. Such constructivism underlay intuitionistic denials of the actual infinite, but I have been explicit that my Aristotelian view is not intuitionistic. I actually find myself sympathetic with Morriston's view that "what follows from the lack of natural boundaries within a region of space is not that the infinitely many sub-regions are not actually 'there', but only that they are not 'there' *apart from a specified way of dividing things up*."[33] So while space is not itself a composition of, say, miles, once we have decided to so model space mathematically it seems to me that it will be objectively true or false that there is an actually infinite number of miles in a specified spatial direction, regardless of the fact that no human being could actually carry out such a division of space.

Puryear thinks that the Aristotelian must make the constructivist assumption, lest one similarly be able to divide a finite interval into an actually infinite sequence:

> It might be supposed that the past could be divided into sub-events *en masse* simply by specifying a way of dividing it into events of a certain duration: for instance, we

> could stipulate that the past divides into consecutive events lasting one second each . . . . Regardless of what duration we chose, it would follow that, if the universe had no beginning, the past would consist in an actually infinite sequence of such events. This, however, will not work. . . . the finitist reply advocated by Craig can succeed only if it requires that divisions be individually specified, since otherwise it would be possible to specify an actual infinity of divisions within a finite region of space or time, in the way suggested by Morriston.[34]

Morriston had suggested that we can specify all the sub-regions of a given region *R* according to the following prescription: starting with *R*, divide the results of the previous division by half, *ad infinitum*. Morriston thinks that we do not need to complete the series of divisions in order to know that relative to this rule there is an actual—and not merely a potential—infinity of sub-regions.

What Morriston and Puryear fail to appreciate is that specifications of Morriston's sort are ruled out, not by the assumption of constructivism, but by paradoxes like that of the Grim Reaper, which show that a sequence such as Morriston envisions is metaphysically impossible. By contrast, if we divide time up into one second intervals, then the number of past seconds in a series of seconds prior to today having no first member would be actually, not merely potentially, infinite. Given a tensed view of time, that sequence of seconds, once specified, has come to be one second after another, so that the entire series was, indeed, formed by successive addition.

Pruss and Koons go on to show how to re-formulate the Grim Reaper Paradox so that the Grim Reapers are spread out over infinite time rather than over a single hour, for example, by having each Grim Reaper swing his scythe on January 1 of each past year if you have managed to live that long. This version of the paradox is thus a form of the *kalām* cosmological argument for the finitude of the past based on the impossibility of the formation of an actual infinite by successive addition.

Cohen has attempted to defeat Pruss and Koons' argument for the past's finitude by constructing a parallel argument aimed at showing the impossibility of the future's finitude.[35] Imagine that every future time *t* is paired with a Grim Reaper whose task is to swing his scythe at *t* if and only if no Grim Reaper swings his scythe at some $t^{*}>t$. Grim Reaper #1 will kill you because no later Grim Reaper does so. But if Grim Reaper #1 kills you, no later Grim Reaper will swing his scythe, and so the conditions are also satisfied for Grim Reaper #2, and so on, which is impossible.

Cohen seems to have fallen into the same trap I did when I first formulated the Tristram Shandy paradox: the situation he describes is impossible because the task he has set is inherently paradoxical. As Koons points out, each Grim Reaper would have to be able to know whether his intended victim "will be alive at the end of his appointed period, and to kill him if he will, which doesn't make any sense."[36] Cohen insists that in his statement of the paradox "what a Reaper does is sensitive what other Reapers do, rather than being sensitive to whether or not [someone] is alive at some time."[37] This is a difference which makes no difference. A Reaper's "swinging his scythe" is a metaphor for killing his victim, so being sensitive to whether a later Grim Reaper swings his scythe just is sensitivity to whether the victim is killed at a later time and, hence, alive

at the end of the preceding period. The Grim Reapers are being commanded to carry out an incoherent set of instructions.

Scientific Confirmation

Had space permitted, I should like to have discussed the status of the current scientific evidence in support of the universe's beginning. In his *Where The Conflict Really Lies*, Plantinga neglects to discuss this aspect of the contemporary scientific worldview, even as an area of mere consonance between science and theology.

I conclude with a word on quantum cosmology and the beginning of the universe. The Borde-Guth-Vilenkin theorem (2003) proves that classical space-time, under a single, very general condition, cannot be extended to past infinity but must reach a boundary at some time in the finite past. Now either there was something on the other side of that boundary or not. If not, then that boundary is the beginning of the universe. If there was something on the other side, then it will be a non-classical region described by the yet to be discovered theory of quantum gravity. In that case, Vilenkin says, *it* will be the beginning of the universe.[38]

Both Vilenkin and, more famously, James Hartle and Stephen Hawking have proposed models of the universe according to which classical spacetime emerges from a quantum gravity regime which eliminates the initial singularity by transforming the conical geometry of classical space-time into a smooth, curved geometry having no edge.[39] By positing a finite, if imaginary, time on a closed surface prior the Planck time rather than an infinite time on an open surface, such models actually support, rather than undercut, the fact that the universe had a beginning. Such theories, if successful, would enable us to model the beginning of the universe without an initial singularity involving infinite density, temperature, pressure, and so on.[40]

If there is such a non-classical region, then it is not past eternal in the classical sense. Hawking describes it as "completely self-contained and not affected by anything outside itself. It would be neither created nor destroyed. It would just BE."[41] But this regime cannot exist literally timelessly, akin to the way in which philosophers consider abstract objects like numbers to be timeless or theologians take God to be timeless. For this region is in a state of constant flux, which, given the Indiscernibility of Identicals, is sufficient for time. Moreover, it is supposed to have existed *before* the classical era, and the classical era is supposed to have *emerged* from it, which seems to posit a temporal relation between the quantum gravity era and the classical era.

(This last mentioned feature of quantum cosmogony, by the way, is very problematic.[42] Emergence can be understood either diachronically or synchronically. But a diachronic emergence of time is obviously incoherent. So how can one make sense of a synchronic emergence of time as a supervenient reality in the context of cosmogony? Quantum cosmologists find themselves at something of a loss here. The best sense I can make of it is to say that the imaginary time description is a lower-level description of classical spacetime prior to the Planck time. (One recalls Hawking's

remark, "Only if we could picture the universe in terms of imaginary time would there be no singularities. . . . When one goes back to the real time in which we live, however, there will still appear to be singularities."[43]) So the same reality is being described at two levels. That implies that if classical spacetime has a beginning, then so does the quantum gravity regime. For they are descriptions of the same reality. In the one a singularity is part of the description; in the other it is not. So what is prior to the Planck time is not the quantum gravity era as such; rather what is prior is the classical period of which the quantum gravitational description is the more fundamental description. If this is correct, then, given the beginning of the classically described universe, it is impossible for the universe as quantum gravitationally described to be without a beginning. For they just are the same universe at different levels of description.)

Be that as it may, it seems that even if time as defined in classical physics does not exist at such a quantum gravity era, some sort of time would. But if the quantum gravity era is in some sense temporal, it cannot be extended infinitely in time, for such a quantum state is not stable and so would either produce the universe from eternity past or not at all. As Anthony Aguirre and John Kehayias argue,

> It is very difficult to devise a system – especially a quantum one – that does nothing 'forever,' then evolves. A truly stationary or periodic quantum state, which would last forever, would never evolve, whereas one with any instability will not endure for an indefinite time.[44]

Hence, the quantum gravity era would itself have to have had a beginning in order to explain why it transitioned just some 14 billion years ago into classical time and space. Hence, whether at the boundary or at the quantum gravity regime, the universe probably began to exist.

Conclusion

Back in 1966 Wallace Matson could quickly dismiss the *kalām* cosmological argument as "the crude cosmological argument."[45] Today so easy a dismissal of the argument is no longer possible nor desirable. For the *kalām* cosmological argument not only raises a host of fascinating questions of philosophical importance, such as the conception of the infinite, the ontology of mathematics, the nature of time and space, the beginning and origin of the universe, and so on, but both its premises have a good claim actually to be true.

Notes

1 Stuart Hackett, *The Resurrection of Theism* (Chicago: Moody Press, 1957).
2 Quentin Smith, "Kalam Cosmological Arguments for Atheism," in *The Cambridge Companion to Atheism*, ed. M. Martin (Cambridge: University Press, 2007), p. 183.

3 Stephen Puryear, "Finitism and the Beginning of the Universe," *Australasian Journal of Philosophy* 92 (2014): 619-629.

4 Al-Ghazali, *Kitab al-Iqtisad fi'l-Iqtiqad* (Ankara: University of Ankara Press, 1962), pp. 15-16.

5 Adolf Grünbaum, "A New Critique of Theological Interpretations of Physical Cosmology," *British Journal for the Philosophy of Science* 51 (2000): 16.

6 *The Tensed Theory of* Time (Dordrecht: Kluwer, 2000); *The Tenseless Theory of Time* (Dordrecht: Kluwer, 2000). These books are dedicated to Alvin Plantinga.

7 Jordan Sobel, *Logic and Theism* (Cambridge: University Press, 2004), pp. 181-9, 198-9; Graham Oppy, *Philosophical Perspectives on Infinity* (Cambridge: University Press, 2006), pp. 291-3.

8 See my *God over All: Divine Aseity and the Challenge of Platonism* (Oxford: University Press, 2016).

9 Solomon Feferman, *In Light of Logic* (Oxford: University Press, 1998), pp. 19, 30.

10 José Benardete, *Infinity* (Oxford: Clarendon Press, 1964), p. 238.

11 Ibid., pp. 236-237.

12 Oppy, *Philosophical Perspectives on Infinity,* p. 48. Arnold Guminski tries to avoid the absurdities by abandoning certain concepts and principles of Cantorian set theory in order to craft a theory of "real infinites," or infinite collections of concrete entities having a cardinality of $_0$ (Arnold Guminski, "The Kalam Cosmological Argument: The Question of the Metaphysical Possibility of an Infinite Set of Real Entities," *Philo* 5 [2002]: 196-215). He proposes that no "real" infinite can be put into a 1-1 correspondence with a proper part. Apart from the question of whether this move really avoids the absurdities, the claim is wildly counter-intuitive. I can understand why someone might question whether collections which can be placed in a 1-1 correspondence really do have the same number of members, but it seems unquestionable that collections having the same number of members can be related 1-1. An infinite collection will thus have proper parts to which it can be related 1-1. For example, a collection of baseball cards having a cardinality of $_0$ can be put into a 1-1 correspondence of every card to every other card.

13 Wes Morriston, "Beginningless Past, Endless Future, and the Actual Infinite," *Faith and Philosophy* 27 (2010): 439–450; idem, "Beginningless Past and Endless Future," *Faith and Philosophy*, 29 (2012): 444-50; Landon Hedrick, "Heartbreak at Hilbert's Hotel," *Religious Studies* 50 (2014): 27–46; Andrew Loke, "No Heartbreak at Hilbert's Hotel," *Religious Studies* 50 (2014): 47–50; Yishai Cohen, "Endless Future: A Persistent Thorn in the Kalām Cosmological Argument," *Philosophical Papers* 44 (2015): 165-87.

14 Cohen highlights a number of metaphysical theses which I have employed in defense of the *kalām* cosmological argument: (i) The A-theory of time is true; (ii) Presentism is true; (iii) Unlike the future, the past and the present are actual; (iv) Platonism about propositions is false; and (v) God's knowledge is non-propositional. He charges that (i)-(v) alone cannot establish a relevant difference between the past and the future, such that

> 5. An infinite temporal regress of events is an actual infinite.

is true and

> 8. An infinite temporal progress of events is an actual infinite.

is false. This shifts the burden of proof. Cohen complains that (i-v) fail to "render (5) true and (8) false" (Cohen, "Endless Future," p. 177). But it is the objector's burden to show that if (5) is true, then (8) is true, or that (5) entails or implies (8). That is no easy

task! All I need do on the basis of (i-v) is to cast reasonable doubt on that implication. It seems to me that a person who is committed to the tenability of (i-v) has good grounds for doubting that (5) implies (8).

15 Hedrick, "Heartbreak," p. 35.

16 "Taking Tense Seriously in Differentiating Past and Future," *Faith and Philosophy* 27 (2010): 451–456.

17 Compare Cohen's interpretation of (5) and (8) in note 14 above as 5_4. An infinite temporal regress of events entails that there were past events such that the number of them is an actual infinite.8_4. An infinite temporal progress of events entails that there will be future events such that the number of them is an actual infinite.Cohen needs to show that (5_4) entails or implies (8_4). But on a tensed theory of time, that is not the case.

18 Hedrick, "Heartbreak," p. 39.

19 Ibid.

20 "Divine Self-Existence," in *Neo-Aristotelian Perspectives in Metaphysics*, ed. Daniel Novotný and Lukáš Novák (London: Routledge, 2014), pp. 269-95.

21 Hedrick, "Heartbreak," pp. 42-3.

22 Loke, "No Heartbreak," pp. 48–9.

23 Cohen, "Endless Future," p. 180.

24 Let *F*=is a future object and *G*=is presently created by God. Cohen affirms

(b) $(\rightarrow x)$ $(Fx \leftharpoondown \searrow Gx)$ Premise

From which it follows that

$Fa \leftharpoondown \searrow Ga$ UI

$Fb \leftharpoondown \searrow Gb$ UI

$Fc \leftharpoondown \searrow Gc$ UI

. . .

Assuming that

Fa & Fb & Fc . . . Premise

it follows that

$\searrow Ga$ & $\searrow Gb$ & $\searrow Gc$ & . . . MP

But from this Cohen's inference does not follow that

$(\searrow Ga$ & Gb & Gc & . . .) Invalid

(My thanks to Daniel Rubio for this symbolization.)

25 Alvin Plantinga, *Warranted Christian Belief* (Oxford: University Press, 2000), pp. 24-5.

26 Robert Koons, "A New Kalam Argument: Revenge of the Grim Reaper," *Noûs* 48 (2014): 256-267; Alexander Pruss, "From the Grim Reaper paradox to the Kalam argument," http:// alexanderpruss.blogspot.com/2009/10/from-grim-reaper-paradox-to-kalaam.html, October 2, 2009; idem, "Probability on infinite sets and the Kalaam argument', http://alexanderpruss.blogspot.com/2010/03/probability-on-infinite-sets-and-kalaam.html/, March 16, 2010. For background see Benardete, *Infinity,* pp. 259-61.

27 Neither can they be composed of what some philosophers have called "gunk," of which every finite interval is composed of sub-intervals, though no points or degenerate intervals exist.

28 For instance, Christopher Isham, perhaps Britain's leading quantum cosmologist; see J. Butterfield and C. Isham, "On the Emergence of Time in Quantum Gravity," http://arxiv.org/pdf/gr-qc/9901024v1.pdf, 8 Jan 1999, rep. in *The Arguments of Time*, ed. J. Butterfield (Oxford: University Press, 1999), §3.2. In fact, Isham believes that "spacetime points should not be taken as real objects, even in interpreting classical

general relativity: rather they are an artefact of the way we have formulated the theory" (p. 30; *cf*. pp. 32-3). See further Nick Huggett and Christian Wüthrich, "Emergent spacetime and empirical (in)coherence," *Studies in History and Philosophy of Modern Physics* 44 (2013): 276–285.

29 Puryear, "Finitism and the Beginning of the Universe," pp. 627-8.

30 With respect to (1) there is no finite number of isochronous proper parts into which a beginningless past can be divided. As for (2), in order for a beginningless series of past events to be potentially infinite, the series would have to be finite but growing in a backward direction. (3) presupposes a tenseless theory of time which contradicts the *kalām* cosmological argument's assumption of the objectivity of temporal becoming.

31 For example, his claim that viewing time or events as merely potentially infinitely divisible commits one to the view that there really is only one time and one event in history; also his claim that sub-intervals of time or space commit one to correlated parts of the occupants of time or space, an assumption which Puryear himself realizes is in trouble and to which he weakly responds (Puryear, "Finitism and the Beginning of the Universe," p. 627, note 9).

32 Wes Morriston, "Craig on the Actual Infinite," *Religious Studies* 38 (2002): 162.

33 Ibid.

34 Puryear, "Finitism and the Beginning of the Universe," p. 628.

35 This argument is also *ad hominem*, targeting the theist who believes in divine foreknowledge. Each Grim Reaper needs to know what the others will do.

36 Koons, "New Kalam Argument," pp. 264-5.

37 Cohen, "Endless Future," p. 183.

38 "If indeed all past-directed geodesics encounter a quantum spacetime region where the notions of time and causality no longer apply, I would characterize such a region as the beginning of the universe" (A. Vilenkin to William Lane Craig, personal correspondence, December 8, 2013).

39 Christopher Isham observes that although quantum cosmogonies "differ in their details they all agree on the idea that space and time emerge in some way from a purely quantum-mechanical region which can be described in some respects as if it were a classical, imaginary-time four-space" (C. Isham, "Quantum Theories of the Creation of the Universe," in *Quantum Cosmology and the Laws of Nature*, second ed., ed. Robert Russell *et al*. [Vatican City State: Vatican Observatory, 1996], p. 75).

40 John Barrow, *Theories of Everything* (Oxford: Clarendon Press, 1991), p. 68.

41 Stephen Hawking, *A Brief History of Time* (New York: Bantam Books, 1988), p. 136.

42 See Butterfield and Isham, "Emergence of Time in Quantum Gravity," pp. 111-68; Vincent Lam and Michael Esfeld, "A dilemma for the emergence of spacetime in canonical quantum gravity," *Studies in History and Philosophy of Modern Physics* 44 (2013): 286–293; Reiner Hedrich, "Hat die Raumzeit Quanteneigenschaften? – Emergenztheoretische Ansätze in der Quantengravitation," in *Philosophie der Physik*, ed. M. Esfeld (Berlin: Suhrkamp, forthcoming), pp. 287-305.

43 Hawking, *Brief History of Time,* pp. 138-9.

44 Anthony Aguirre and John Kehayias, "Quantum Instability of the Emergent Universe," arXiv:1306.3232v2 (hep-th) 19 Nov 2013. They are specifically addressing the Ellis-Maarten model, but their point is generalizable.

45 Wallace I. Matson, *The Existence of God* (Ithaca, N.Y: Cornell University Press, 1965), p. 56.

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